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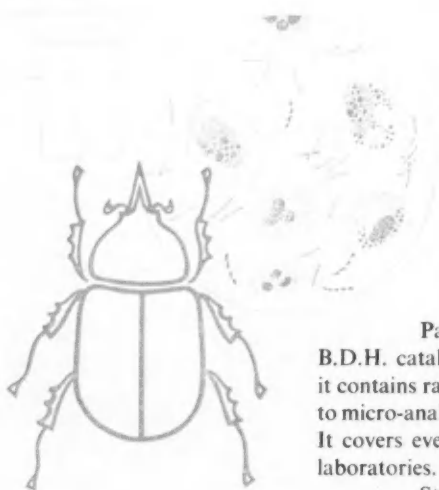
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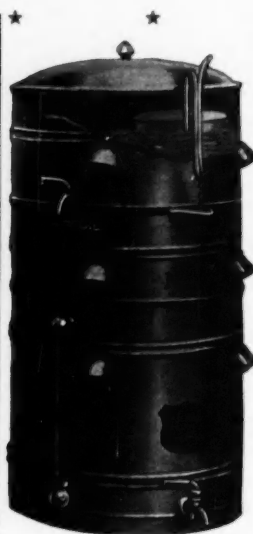
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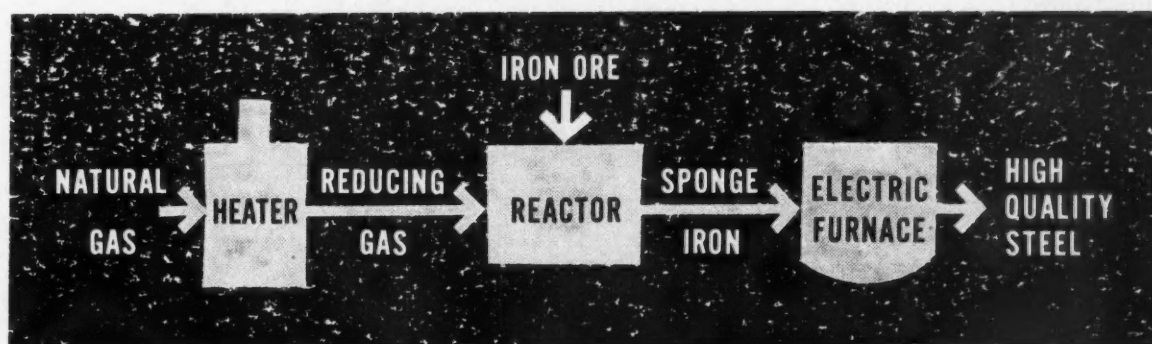
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CHEMICAL AGE

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DECIMAL SYSTEM

THE question of whether or not Great Britain should fall into line with Continental and other practice and adopt the decimal system for weights and measures is not a new one. Many sections of industry would welcome such a change, but approaches in the past have been pigeon-holed because of the many political, social and educational problems involved.

Whether a new move now in hand to sound industrial opinion on this highly controversial subject will suffer a similar fate remains to be seen. At any rate two fresh attempts to revive the question were put in hand last year by the British Association for the Advancement of Science and the Association of British Chambers of Commerce.

When it was realised that both were tackling the same problem, although from slightly different viewpoints, the two organisations decided to liaise and to send out a joint questionnaire. This has gone to trade associations, professional and learned societies and to many hundreds of individual companies in the fields of banking, merchanting and manufacturing.

Answers to the many questions are now being collected by the two organisations—in some cases trade associations are still compiling their replies, among them being the Association of British Chemical Manufacturers, which reports a good response. It is, of course, too early for any conclusions to be drawn. The answers must first be analysed in detail and it is expected that the outcome will be published by the autumn of this year.

The British Association decided to inquire into the question objectively and a special committee was set up under the chairmanship of Sir Hugh Beaver (Arthur Guinness Son and Co. Ltd.) to investigate the costs and implications of adopting the metric system in this country. Also on the committee are Dr. R. Beeching, director of I.C.I.; Mr. G. A. Dummett, research director of the A.P.V. Co.; Dr. A. H. Hughes, assistant managing director, Arthur Guinness Son and Co.; and Mr. F. S. Walker, chairman of Lever Brothers, Port Sunlight, Ltd.

While members of this committee represent a wide cross-section of manufacturing industry, the A.B.C.C. decimal coinage and metric system panel is mainly composed of representatives of banking, export and merchant interests. Its chairman is Mr. C. A. J. Martin, an executive director of Crompton Parkinson.

Firms which received the joint questionnaire were asked to indicate the broad proportion of their total output or volume of trade which was produced or marketed in metric units and whether their use of the metric system had increased or decreased in the past five years. They were also asked if the proportions made or sold under the metric system would be expected to change under freer European trade. A further question asked if trade was being affected by the retention of the imperial system of weights and measures.

Other questions asked for the attitude of U.K. firms in the event of (a) the U.S. and the Commonwealth adopting the metric system and (b) if the U.K. should adopt it, but if the U.S. and Commonwealth and the U.S.

should retain the non-metric system for industry.

The two associations also sought to discover estimates of the additional costs which would be incurred by firms in changing over to the metric system, that is by replacing or adapting equipment, plant, machinery, drawings, specifications, other printed matter and through operating costs during the changeover period.

A second section of the questionnaire asked if firms used decimalised forms of the imperial system for linear, square and cubic measurement, capacity, weight—if so for what purpose and to what extent.

A final section dealt with the decimalisation of the coinage and firms were asked to indicate their attitude to such a step. They were also asked to show a preference for

one of four decimal coinage systems (a) £1 = 10 florins = 1,000 mils (a 'mil' being slightly less than $\frac{1}{4}$ d.); (b) £1 = 10 florins = 100 cents (a 'cent' would equal 2.4d.); (c) 10s. = 100 cents (a 'cent' would equal 1.2d.); (d) a new unit to equal 100d. (2.4 new units would equal present £).

The inquiry will provide valuable information not only on the extent to which manufacturers already produce and sell goods to metric measurements, but on the cost to them of a complete changeover. Analysis of the forms will also reveal those industries in which support is strongest; these will surely include the chemical industry, a large proportion of its big export trade going to metric system countries.

If the inquiry shows strong support from industry in general for a change, it might well be that the formidable political and social hurdles could be overcome.

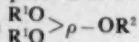
PETROCHEMICAL'S POLYTHENE PROCESS

A PAPER was read by M. N. Berger and T. H. Boulton of Petrochemicals Ltd. on 'Ziegler polyethylene' at the joint S.C.I.-R.I.C. symposium on 'Some newer polymers—their structure and uses'. Boulton, in association with R. N. Haward, on behalf of Petrochemicals Ltd., has had accepted British Patent 803,557 which deals with 'Improvements in or relating to polymeric materials comprising low pressure polyolefines'. This patent relates to olefins containing up to 10 carbon atoms in the molecule, and is concerned particularly but not exclusively with a polythene, prepared by the so-called Ziegler low-pressure process using a catalyst of the Ziegler type as formed, for example, by mixing aluminium-tri-ethyl or tri-isobutyl or aluminium diethyl monochloride with titanium tetrachloride.

Haward and Boulton, in this patent claim that it has been found that certain organic phosphites are valuable constituents in polymeric materials containing as the major constituent a low-pressure polythene or polypropylene or copolymer thereof, i.e. Ziegler polythene. Such polyolefins may undergo degradation and discoloration in use (e.g. as the result of exposure to light) or in subsequent processing as when subject to milling or other working at elevated temperatures (above 100°C).

A considerable number of compounds are already known as additives for polymeric compositions based on many of the synthetic polymers now available. These compounds—non-staining antioxidants—impart resistance to degradation without noticeable coloration. In the case of low-pressure polythene an appreciable number of known additives have been tested, but many of these have been found to act in an unexpected manner in that although they may reduce degradation, they also produce marked colour formation. Dicrosyl propane, an antioxidant for use with polythene produced by the conventional high-pressure process, produces pronounced discoloration when used for Ziegler polythene.

The Petrochemicals patent deals with a polymeric material containing a major proportion of a polymer obtained by polymerising an olefinic compound by the low-pressure process which includes a minor proportion of an organic phosphite having the general formula



in which R^1 and R^2 represent the same or different hydrocarbon radicals which may be substituted or unsubstituted alkyl, cycloalkyl, aryl or alkaryl radicals. These may be derived from a monohydric alcohol, or a monohydric phenol, or a hydrocarbon-substituted monohydric phenol, preferably an alkyl-substituted monohydric phenol. Up to about 1.0% of the said phosphite by weight of low-pressure polythene, it is claimed, will usually be sufficient in carrying out the present invention and for preference the amount of phosphite is between 0.06 and about 0.6% and between 0.2 to 0.3 and 0.5% by weight of the polymer.

The radicals R^1 and R^2 are preferably the same and are alkyl or alkyl aryl radicals which comprise at least 9 carbon atoms, although in many instances trialkyl phosphites, particularly tri(n-alkyl) phosphites, in which the radicals R^1 and R^2 are alkyl radicals, each having less than 9 carbon atoms (eg. octyl, hexyl and pentyl radicals) are reported to be preferred on the grounds of availability of the starting materials and ease of preparation of the phosphites in a pure condition. Phosphites having branched alkyl radicals each having less than 9 carbon atoms, however, are not excluded. Also, mixtures of two or more organic phosphites, e.g. alkyl or alkaryl phosphites, as defined above, may be present in the polymeric materials.

Details are given of the preparation of these organic phosphites. They may be prepared by reacting a phosphorus trihalide with a phenol or an alcohol, i.e., a phosphorus trihalide may be reacted with cyclohexyl phenol, carvacrol and *o*-phenyl phenol. The reaction may be carried out by heating a mixture of the phosphorus trihalide with the phenol or alcohol at a temperature at which hydrogen halide is evolved (about 200°C). A wide range of organic phosphites can be prepared, by reacting, for example, two alcohols, or two phenols or either an alcohol and a phenol with a phosphorus trihalide or by forming a mono-aryl phosphorous acid dihalide or diaryl phosphorous acid monohalide as an intermediate and then reacting this with an alcohol or phenol to form the required phosphite.

Examples given of suitable phosphites are tri-hexyl phosphite, tri(2-ethyl-hexyl) phosphite, tri-lauryl phosphite, tri-actyl phosphite, tri(*p*-isopropyl-phenyl) phosphite, tri(*p*-tertiary-butyl-phenyl) phosphite, di(*p*-tertiary-butyl-phenyl) monophenyl phosphite, tri(n-octyl) phosphite, tri(n-nonyl) phosphite, tri(nonyl-phenyl) phosphite, tri-stearyl phosphite and tricyclohexyl phosphite.

The present patent includes a process for preparation of a polymeric material comprising a major proportion of L-P polythene and a minor proportion of an organic phosphite as defined above. The phosphite is incorporated in the polythene by milling at about 100°C. Up to about 1% by weight of phosphite is used. Or the mixture can be extruded or mixed in a Banbury mixer.

It is reported that these phosphites can also be used in conjunction with other types of stabilisers and/or antioxidants for polymeric materials; in particular, chlorine-accepting stabiliser such as are used with polyvinyl dichloride i.e. cadmium and calcium stearates, polymeric glycidyl polyethers and alkyl tin esters.

The phosphites noted as being particularly preferred are the trialkyl phosphites, such as tri-lauryl and tri-octyl phosphites and certain of the aryl phosphites. Tri(nonyl phenyl) phosphite (Polygard) is stated to be particularly effective in arresting degradation, especially on prolonged exposure to light and, to a certain extent, discoloration of low-pressure polythene at elevated temperatures.

HEAVY SCIENTIFIC PROGRAMME FACES DUKE OF EDINBURGH AND SIR A. FLECK IN INDIA

WHEN the Duke of Edinburgh left by air on Tuesday to attend the Indian Science Congress and later the meeting of the Pakistan Association for the Advancement of Science he was accompanied by Sir Alexander Fleck, president of the British Association for the Advancement of Science. Sir Alexander will also accompany the Duke on a number of visits to scientific institutions and industrial organisations in both India and Pakistan.

On the day of arrival, Wednesday, they attended the inauguration of the Indian Science Congress at Delhi University, and Sir Alexander read a message from the British Association. The following day, the Duke addressed the Congress. On 24 January he is scheduled to visit the National Physical Laboratory, and the Agricultural Research Institute in Delhi. In the evening he was replying to a toast at the dinner party given by the President to the heads of the delegations to the congress.

Nangal Dam

On 25 January, the Duke and Sir Alexander are to visit the Bhakra and Nangal Dam, which is also the site for an industrial building programme that includes the new Nangal Fertiliser Works. On 27 January, they will attend further congress meetings. The following day, His Royal Highness is to inaugurate a study conference at the Ahmedabad Textile Industries' Research Association, and on 29 January he will visit the Atomic Energy Establishment at Trombay and the Tata Institute for Fundamental Research.

On Saturday, 31 January, the Duke and Sir Alexander travel by Comet to Madras to visit the Leather Research Institute; two days later the Duke is to address the golden jubilee celebrations of the Indian Institute of Science.

A visit to Ondal and Durgapur to tour the site of the new steelworks being built by a British consortium at a cost of over £100 million has been arranged for 3 February. Also on this day is a visit to the Stewarts and Lloyd's plant and the National Metallurgical Laboratory at Jamshedpur.

At Decca on 4 February, the Duke and Sir Alexander will attend a lunch party given by the Pakistan Association for the Advancement of Science and on the following day at Karachi they will be present at the opening session of the association's meeting; Sir Alexander will read a message from the B.A. Before the Duke addresses the meeting on 7 February, he will visit the laboratories of the Pakistan Council for Scientific and Industrial Research and the Institute of Cotton Research.

The Karachi Polytechnic will be visited on 9 February when the Duke

will also attend the association's meeting, a reception at Karachi University and the association's dinner in the evening. On 11 February, the High Tension Laboratories, Punjab University and the Laboratories of the Directorate of Land Reclamation will be seen. After a visit to the C.S.I.R. laboratories on 13 February, the Duke is to tour Peshawar University the following day.

The visit to India and Pakistan ends on 18 February, when the Duke of Edinburgh is to fly from Karachi for Burma.

Substantial Increase in D.S.I.R. Grants to Universities

UNDER its second five-year plan, the Department of Scientific and Industrial Research proposes to make a substantial increase in the number of its postgraduate studentships and fellowships in science and technology. Nearly 1,900 postgraduate students are now supported by D.S.I.R. and this number is expected to rise to about 3,800 by 1963-64, in which year expenditure on this scheme, at current rates, may exceed £1½ m.

The amount of money available under the D.S.I.R. scheme of grants for special researches to assist research projects in science and technology at universities and colleges is expected to increase between three- and four-fold, rising to about £1½ million for 1963-64.

New Shell Simazin-base Weedkiller said to Kill all Weeds

A VIGOROUS marketing campaign marks the introduction of 'Shell total weedkiller' said to destroy all weeds. Based on Simazin, a chemical which has extremely good persistence, it is non-toxic, non-corrosive and non-inflammable, the new product will destroy grass as well as weeds. Chemical composition of Simazin is chloro-di-amino-tri-azime.

The Shell Chemical Co. Ltd. state that their new weedkiller is absorbed by the roots of the weeds and is easy to apply as a spray. Best results are obtained when it is applied just before plant growth starts in the spring. An even coverage of the ground is then possible without the obstruction of a canopy of weed growth, and less dead vegetation is left behind. Once the weedkiller has been applied, results will be apparent

three to six weeks later. The ground will then be free of weeds for 12 months, after which a maintenance dose is recommended.

The product has the advantage of not leaching out, which gives a very good lasting effect. Another advantage claimed for the product is that it will not 'edge' or creep from the sprayed area on to nearby plants or lawns.

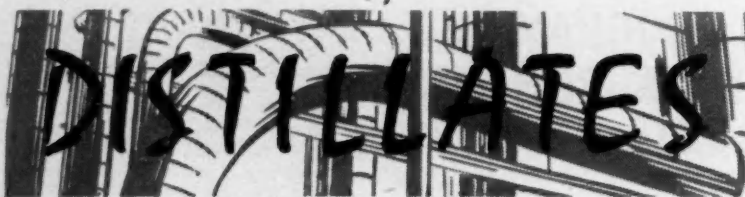
Apart from use on farms and in gardens, 'Shell total weedkiller' can be effectively applied to clear building sites and other public places under municipal care. Building sites can be cleared before work starts and then kept weed free by yearly maintenance doses.

'Shell total weedkiller' is a 50% wettable powder and is sold in 5 lb. tins or 56 lb. drums.

Chemical Officers at Manchester A.G.M.



At the recent annual meeting of the Chemical and Allied Trades Section, Manchester Chamber of Commerce, are, l. to r., seated: F. Savaage (Anchor Chemical Co. Ltd.); G. Innes (I.C.I.); E. Tomlinson (sectional secretary); J. A. Lackey (deputy secretary); standing, l. to r., are: M. E. Meredith (Monsanto Chemicals Ltd.); E. D. Carey (I.C.I. Pharmaceutical Division), and C. E. Young (Hardman and Holden Ltd.). (For report of meeting see 'Chemical Age,' 17 January, p. 141.)



★ SPECULATION is rife in the U.S. regarding Mr. A. I. Mikoyan's visit to that country. One qualified official of the A.F.L.-C.I.O., I read (*Chem. and Engr. News*, 1959, 37, No. 2, 23), suggests that the Soviet deputy premier's main purpose is to obtain high commercial credits for the U.S.S.R.'s chemical industry from the U.S. banks. Dow Chemical's recent purchase of benzene from Russia is indicated as an entrée.

Leading U.S. banks say they have not yet been approached by the Russians, but in answer to the question "Will you do business with the Soviet," most of them hedge. Some would consider working with the U.S.S.R. if the U.S. Government approves the deals.

It will be recalled that the U.S.S.R.'s chemical industry is about a third that of the U.S. industry, but a seven-year, \$25 thousand million expansion in chemicals was announced last year, the largest being a 300% increase in chemical output by 1965. A U.S. observer team after a tour of Soviet chemical plants last year considered them obsolete.

There have been many indications that the Russians would like to obtain U.K. and U.S. technical know-how but very little softening appears to have occurred in the attitude of this country and the U.S. to this suggestion of providing know-how. Prominent in many minds is the fact that U.S. banks have lost in past dealings with the Soviet. As far as the U.S. is concerned, the U.S.S.R. would have to pay back what they owe through confiscated holdings and make very tempting offers to succeed.

★ DURING 1958, capacity of the silicones plant of I.C.I.'s Nobel Division at Ardeer was increased five-fold. Ten years ago silicones were imported to Britain in small developmental quantities. Last year nearly 1,000 tons of silicone products were used in Britain.

Silicones are now prepared as fluids, resins and rubbers. The fluids are chain polymers and the chains may be long or short. Short chains give fluids which flow like water, the longer the chain the more slowly the fluid flows until with very long chains, the product is a viscous gum. These chains are made of silicon-oxygen-silicon atoms, linked in line many times. Such a chain would only be satisfied if other groups of atoms are caught on to the silicon atoms. These 'organic' groups endow the resulting silicone with its notable water repellency and make it soluble in such liquids as white spirit, toluene and benzene.

Silicon resins are more complex than the fluids. They are prepared by inducing cross-linking between chains rather like the cross-linking of silica found in

quartz. Silicone rubbers are formed when suitable fillers are machined with silicone gums on rollers; the rubbers are cured by a heating process resembling vulcanisation.

With a working temperature range of 300°C to -80°C silicones have a resistance to heat far superior to that of most organic materials, while at the other extreme they remain serviceable without becoming brittle.

★ ONE HEARS so much these days about US selling methods being better than those of British industry (a view which I strongly repudiate) that it is pleasant to be able to record that the world's largest personal sales training organisation is British.

Credit for this goes to the Tack Organisation of Longmore Street, London SW1, whose courses have been attended by executive and salesmen of 2,000 companies, including many in the chemical industry. Alfred Tack, who with George Tack pioneered organised sales training in the UK 25 years ago, is the author of 'Sell Your Way to Success' a book that has been translated in 14 languages.

Among chemical and allied firms which have utilised this service are British Oxygen Co., Vitax Fertilisers, Stotherts Ltd., Prince Regent Tar Co., Leicester Lovell and Co., Quickfit and Quartz, Bayer Products, Fisons Pest Control, British Schering, Fisons Ltd., British Celanese, Foundry Services, Secomastic, Q.V.F., B.I.P. Chemicals, Brotherton and Co., and Premier Colloid Mills.

★ ISOLATION of the first intermediate in the synthesis of long-chain fatty acids from acetic acid has been announced by Dr. S. Wakil, Enzyme Institute, Wisconsin University, U.S. The intermediate has been identified as malonic acid. Discovery of a completely novel and unexpected route for synthesis of fatty acids is anticipated.

Fatty acid metabolism has been a major research project at Wisconsin for 10 years. As a result of the latest discovery, the workers concerned are convinced that fatty acid synthesis is not the reverse of fatty acid oxidation. Investigation has led them to believe that the system studied, that of conducting synthesis of palmitic acid—the main constituent of the fat in fatty tissues of the animal body—is the one employed most generally by the living organism in synthesising fatty acids from acetyl co-enzyme A molecules.

Biotin, has been shown by the Wisconsin workers to be an essential part of the enzyme processes involved in this synthesis. The fact that both biotin and

carbon dioxide are needed for synthesis led to the isolation of malonic acid. Wakil reports that a biotin-containing enzyme is involved in the linking of carbon dioxide to acetyl co-enzyme A with the formation of malonic acid.

★ FOLLOWING my note last week on the contribution chemical and plastics manufacturers had made to the success of the balloon 'The Small World,' I now learn that the crew made good use of Permutit 'drinking-water-from-sea-water' kits. The kits were of standard design normally provided for shipwreck and aircraft survivors. Each kit can produce 4½ pints of drinking water and yet occupies a space of only 33 in. by 3 in. by 4½ in.

Operating by a special ion exchange process, no heat is needed and the sea water is merely mixed with the ion exchange briquettes in a flexible bag; the pure water is then squeezed into the Perspex box, which also serves as a container for the kit.

From *The Billingham Post*, I gather that I.C.I.'s Billingham Division supplied hydrogen for the balloon. In all 150,000 cu. ft. were provided in nearly 700 cylinders which came from the British Oxygen Co.

★ THERE is often more in a picture than meets the eye. This was the case with an illustration shown in *CHEMICAL AGE*, 10 January, p. 92, of a stainless steel sphere being radiographed by Ashmore, Benson, Pease and Co., one of the Power-Gas group. Two spheres of 10 ft. internal diameter are being made for British Oxygen Wimpey. The material is 18 Cr 8 Ni titanium-stabilised stainless steel. Each of the vessels is being tested to 2,550 p.s.i.

Interesting point about this project is that the welding is automatic and I believe that no other British company has tackled the automatic welding of 2½ in. thick stainless steel.

★ CURRENT revision of B.S. 1500 on pressure vessels, will please many chemical engineers and manufacturers, who feel that the British industry is handicapped in its export trade because the design stress imposed by the original standard are too severe. The B.S.I. committee concerned is said to sympathise with this view, but has called for more information before safety factors are reduced. Action is now being taken to obtain this information so that "changes can be made in the B.S., if required, as soon as possible."

Part 1 of the standard, full title of which is 'Fusion-welded pressure vessels for use in the chemical, petroleum and allied industries,' deals with carbon and low alloy steels; other parts will cover pressure vessels of austenitic steel and non-ferrous metals.

Alembic

R.S. To Celebrate Tercentenary In 1960

THE Royal Society, founded on 28 November 1660, by a group of originally minded men with Charles II as the 'formal founder,' proposes to celebrate the tercentenary from 18 to 26 July 1960. A committee with Sir Cyril Hinshelwood, president, as chairman has already begun planning for this event.

Leading scientists from all nations are expected to attend the events, which are to include special visits to the City of London and the Universities of Oxford and Cambridge, both of which have important links with the society's development over three centuries.

Other members of the tercentenary celebrations committee are: Lord Adrian, Sir Gavin de Beer, Professor P. M. S. Blackett, Sir Lawrence Bragg, Sir Lindor Brown, Sir Charles Dodds, Sir Alexander Fleck, Sir Howard Florey, Professor W. V. D. Hodge, Sir Harry Melville, Sir William Penney, and Dr. H. G. Thornton. Dr. D. C. Martin, R.S. assistant secretary, is secretary to the committee.

Urgent Need For More Scientists

DOUBLE the present output of graduates in pure and applied science will be needed in 1970, states Mr. Richard Fort, M.P., in 'Scientific and Engineering Manpower Survey' (Political and Economic Planning—P.E.P.—price 2s. 6d.). This means a total of 20,000 graduates against 10,000 at present. Mr. Fort believes that higher education for science will have to expand as rapidly during the next 10 years as it has done in the past decade.

In view of the present serious shortage of trained manpower, the survey calls for a more realistic use of those who have scientific and engineering qualifications; more of them should be given responsible administrative and commercial posts. Reference is made to industry's failure to employ women graduates in science and technology in numbers corresponding to those studying these subjects at the universities.

It is stated that 141 companies are subscribing to the Industrial Fund for the Advancement of Scientific Education in Schools; the amount so far subscribed is £3.2 million.

Bradford Course on Stereospecific Polymers

A special short course on 'Stereospecific polymers and block and graft co-polymers' is to be held by the Department of Chemical Technology, Bradford Institute of Technology, on 27 and 28 February at a fee of £2 5s. The introduction to the course will be given by Dr. W. R. Moore, reader in high polymer chemistry, and other lectures will be given by Professor C. E. H. Bawn (Liverpool University), Dr. I. Goodman (I.C.I. Fibres Division), Dr. C. H. Bamford (Courtaulds), and Dr. W. Oppel (Dunlop Research Centre). The course will include informal discussions, visits to the institute's polymer research laboratories and a showing of films.

A.E.A.'S NEW £12 M. URANIUM PLANT NOW OPERATING

NEARING the end of its commissioning period is the world's most modern and advanced plant for the production of uranium fuel elements for the civil nuclear power stations already built and soon to be built by the five consortia using B.I.C.E.P. This plant is the £12 million U.K. A.E.A.'s Springfield Works, Lancs, where the millionth uranium fuel element will shortly be dispatched. The new uranium processing plant and fuel canning assembly lines were shown to visitors on Tuesday.

No figures of production capacity were released, but Sir William Cook, member for engineering and production U.K. Atomic Energy Authority, stated that the plant would be capable when completed of supplying uranium fuel for both U.K. and British-built foreign nuclear power stations. Ample capacity is already present to fulfill both British and foreign orders. As further nuclear power stations are contracted for, expansion will be required.

A problem of production is that each commercially built station differs slightly in design and separate types of fuel elements will no doubt be necessary. This will require separate assembly lines.

At Springfield, there are facilities for laying down further fuel canning assembly lines and expanding production plant. It is suggested that with current facilities and the coming into operation of the new plant in stages up to October of this year there is a capacity somewhat in excess of 1,000 tons of uranium fuel

for power stations a year. Uranium is also produced for the Capenhurst plant where the enriched uranium containing ²³⁵U is manufactured.

The new plant works on a continuous flow and very largely automatic system. Cost of production of 1 ton of uranium is expected to be of the order of £20,000 to £22,000 ±10%. Special uranium fuel rods for the British Industrial Collaborative Experiment Pile (B.I.C.E.P.) in operation at the U.K. Atomic Energy Research Establishment, Harwell, are also made at Springfield. B.I.C.E.P. is the unit designed to carry out experiments in the physics of reactor furnace design for the five consortia (A.E.I.-John Thompson Nuclear Energy, the General Electric-Simon Carves Nuclear Power group, the English Electric-Babcock and Wilcox-Taylor Woodrow group, the Nuclear Power Plant Co., and Atomic Power Construction). The reactor furnace is providing design information for these companies. It is also suggested that later a full-scale experimental zero energy reactor may be constructed as an industrial collaborative effort at the new Winfrith Heath, Dorset, research station.

Development work is also being carried out on uranium fuel elements for the advanced gas-cooled reactor (A.G.R.) now being set up at Windscale, designed as the successor to the Calder Hall type power station.

The uranium chemical processing and production plant will be described in CHEMICAL AGE next week.

Pilkington's £4 m. 'Float Process' for Glass Making

OVER the past seven years, Pilkington Brothers Ltd. have been working on a method for making high quality glass by means of the 'Float Process' at their Doncaster works.

Developed at a cost of £4 million, the process is described by the company as "The most fundamental, revolutionary and important of all the advances in glass-making of the present century". It is stated also that the new process will result in better and cheaper glass.

Technical advantages claimed for the new process are that: the glass produced is exceptionally parallel and free from distortion; the fire polished surfaces which are obtained are of better quality than those achieved by grinding and polishing; and the method of production is continuous and so lends itself to fully mechanised treatment from raw material handling to finished product. Capital expenditure is stated to be reduced, the plant requires less space and manpower, and maintenance costs are lowered.

Basis for the new process is a continuous ribbon of glass floating on a bath of molten metal in a controlled atmosphere so that the glass emerges with a brilliant smooth finish; grinding is thus eliminated.

Plasinter Process For Plastic Finish On Metal Products

PLANT capable of bonding polythene and many other types of plastics material to ferrous or non-ferrous metal using the Plasinter process has been installed by Darlston Galvanised Holloware Co. Ltd., Progress Works, Holyhead Road, Wednesbury, Staffs. The process is claimed to overcome peeling completely, and is expected to have many applications in engineering, agricultural and marine industries, etc. It is stated to be particularly suitable for wire work, tubular steel assemblies, sheet metals, aluminium ware, brackets, castings, etc.

Metals coated using the new technique are protected from corrosion, and the coatings, it is reported, will withstand sterilisation in boiling water. Other advantages are good electrical insulation properties, reduced maintenance, etc. In particular, with the Plasinter process many of the inherent disadvantages associated with homogenous polythene articles such as porosity and induction of static electricity are to a large degree overcome.

The coatings can be supplied, where required, in many bright colours. Processing cost is stated to compare very favourably with other more traditional finishes.

B.D.H. PRODUCE SODIUM HYDROXIDE IN FLAKE

NEW additions to British Drug Houses range of organic and inorganic chemicals are *m*-amino-benzo-trifluoride, amylopectin from potato starch, 1:2 dimethoxy-ethane (ethylene glycol dimethyl ether), oxalyl dihydrazide, sodium hydroxide flake, DL-tocophenol acetate and sugar phosphates and some closely related substances.

Hitherto pure sodium hydroxide has only been available in the form of pellets or sticks. BDH are now able to include flake sodium hydroxide, of laboratory purity, in their range of chemicals. It is considerably cheaper than either sticks or pellets.

The use of oxalyl dihydrazide in a reaction for the spectrophotometric micro-determination of copper has been described (Gunnar Gran, *Anal. Chim. Acta*, 1956, 14, 150). An intense blue-violet colour is obtained if a weak solution of copper is mixed with ammonium hydroxide, oxalyl dihydrazide and a large excess of formaldehyde or acetaldehyde and this provides a highly sensitive, selective and specific spectrophotometric method for the determination of microgramme quantities of copper (5 to 50 μ g.). Oxalyl dihydrazide is supplied

as an off-white crystalline powder having a melting point of 248°C.

A solvent miscible with water, ethanol, acetone, diethyl ether, octane and benzene and supplied as a colourless liquid boiling at about 85°C is 1:2-dimethoxy-ethane. It has been used for preparing sodium diphenyl reagents used for determining halogen in hydrocarbons, and hexaphenyldisilane and other hexa-aryl disilanes have been cleaned with sodium, potassium or lithium in 1:2-dimethoxy-ethane. Also, according to U.S. patent No. 2,680,059, it can be used to stabilise metal hydrides.

Characteristic reactions of primary aromatic amines, the trifluoromethyl group being reactive are exhibited by *m*-amino-benzotrifluoride. The diazonium salts derived from this chemical can be hydrolysed with formation of *m*-trifluoromethyl phenol and they can be coupled with azo coupling agents to give dyes of good brightness and light fastness (U.S. Patent No. 1,999,610). *m*-Amino-benzotrifluoride reacts with methyl iodide to form *N*:*N*-dimethyl-amino-benzotrifluoride; and it undergoes the Skraup reaction with formation of 5-trifluoro-methyl quinoline.

Designs for Inert Gas Production Proved by Birlec of Birmingham

THE periodic removal of fuel gas from pipes, tanks, gas holders and process vessels used in the manufacture or handling of fuel gases calls for a suitable inert purge gas. For example, after a catalytic refining process has been carried out for a time, the catalyst promoting the process needs cleaning. Before this can be done, fuel must be purged out of the plant. When the plant is again ready to be put on stream, the system must be purged with inert gas to ensure the removal of all traces of oxygen in each case, to avoid the possibility of explosion.

In connection with needs of this kind, the Dryer and Gas Plant Division of Birlec Ltd., Erdington, Birmingham 24, is at present engaged in designing an inert gas generator with a capacity of 200,000 cu. ft./hr. In the design, air mixed with propane is deliberately

ignited within an enclosed cylinder, and the inert gases generated by the combustion are collected and employed in the purging process. Development work on inert gas generator design is being carried out by the company to establish the optimum sizes of burner for a wide range of generator capacities.

Government Contract to Buy I.C.I. Titanium to Expire Soon

A Government four-year contract to purchase three-quarters of the titanium output at Wilton Works of Imperial Chemical Industries, Ltd., expires in August and the company is seeking new outlets for this metal. Curtailment of the Government's programme of military aircraft, in favour of guided missiles, has caused a drop in demand, and resulted in increased stocks.

New Economic Raw Material for Detergent Makers

OPTIMUM detergent properties, it has been established, are associated with a branched alkyl chain with 12 carbon atoms based on four propylene residues. Cyclo Chemicals Ltd., Manfield House, Strand, London W.C.2, have recently introduced Cyclorlyl ABSA, a very highly concentrated alkyl benzene sulphonic acid based on propylene tetramer alkyl benzene. This compound is obtained by sulphonation with sulphur trioxide, ensuring a minimum content of electrolytes and water and the maximum possible content of wash-active substance.

Cyclorlyl ABSA is described as a dark brown, viscous liquid which is stable over a wide range of temperature. It is supplied at a minimum of 99% active. Average acid value of the material is 320 and requires the following weights of alkalis to neutralise 1,000 gm.:—

220 gm. caustic potash, 153 gm. caustic soda, 210 gm. 880 ammonia, 584 gm. triethanolamine and 238 gm. monoethanolamine.

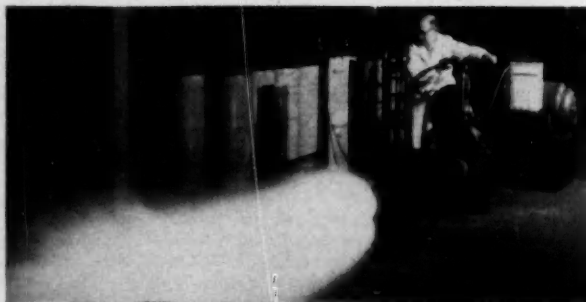
The manufacturers recommend that Cyclorlyl ABSA be added to a prepared solution of alkali in water with constant stirring, until it has all dissolved. Ammonium products should be adjusted to a slightly alkaline pH, and other salts as near as possible to neutral, preferably using a pH meter. It is also possible to neutralise by diluting the material with water and then adding a solution of alkali. This latter method is recommended when it is desired to bleach the acid before neutralisation. The strong acid solution, however, can attack mild steel, and therefore should be handled in non-corrosive vessels. In neutralisation by the first process, mild steel vessels can be used.

Monsanto Chemicals to Build an S.D. Maleic Anhydride Plant

UNDER an agreement with Scientific Design Co., New York, and its affiliates, Monsanto Chemicals Ltd. state that S.D. will erect at Newport, Mon, a new maleic anhydride plant to produce 15 million lb. per annum, using an S.D. process. The plant is scheduled for completion during the second half of 1960 and will represent a considerable expansion of Monsanto's existing maleic anhydride production in the U.K.

In addition to meeting all foreseeable future requirements of British industry, the new plant will enable the company to develop export business which has not been possible from its present operations. In the S.D. process, maleic anhydride is produced by continuous catalytic vapour-phase air oxidation of benzene, and is regarded as particularly suitable for the size of operation envisaged.

Maleic anhydride has important uses in the manufacture of polyester resin, alkyd resin, fungicides, plasticisers and other chemical specialities.



Birlec laboratory test on new burner design. Heat released by this flame is of the order of 20 million B.Th.U. per hour

New Instruments and Techniques at the Physical Society Exhibition

'Chemical Age' Reviews Many New Developments Seen on Stands

LAATEST developments in instruments, apparatus and equipment were shown by 153 exhibitors at the 1959 Physical Society exhibition held from 19 to 22 January in the Royal Horticultural Halls, London. Exhibits included many new and improved models, as well as a number of prototypes, of interest to the chemical industry and the industrial chemist. A number of these are reviewed below.

The exhibition was opened by Sir Cyril Hinshelwood on 19 January and included a special exhibit by Swedish universities and research organisations in which a selection of instruments was shown under the auspices of the Royal Swedish Academy of Engineering Sciences.

Airmec Proximity Detector

The proximity detector type N266 shown by **Airmec Ltd.**, High Wycombe, is a capacity switch which operates a relay system when any substance is brought within a pre-determined distance from the sensing probe. It has a wide range of applications and is suitable for insertion in liquids, powders, etc. Transistorised and printed circuits are employed in the amplifier, which may be operated from mains or battery.

The sensing probe may be mounted either on the case of the instrument or on the end of an armoured extension cable which may be up to 25 ft. long. Probes of 2 in., 4 in. and 8 in. are available in waterproof covers suitable for use in liquids at temperatures up to 100°C.

The assembly is designed for bulkhead fitting and is contained in a cast metal box with sensitivity and balance controls accessible through holes in the front of the casing. The circuit remains quiescent when the capacity to the probe is constant at a pre-set value, and operates

when the capacitance becomes greater or smaller than the pre-set value. Sensitivity is equivalent to a change in capacitance of 0.02 pF, but this may be varied to suit any particular application. The capacity of the probe at balance is 8 pF maximum and may be increased by adding capacitance inside the instrument as required.

Catalysts for Tail Gas Treatment

During the catalytic oxidation of ammonia to yield nitric acid, considerable quantities of tail gases are produced. These consist largely of nitrogen together with small quantities of nitrogen oxides. In the past it has been possible to discharge these noxious fumes directly to atmosphere. However, certain provisions of the Clean Air Act introduced in June 1958, will probably restrict this practice unless the effluent is pre-treated to reduce the nitrogen oxide content.

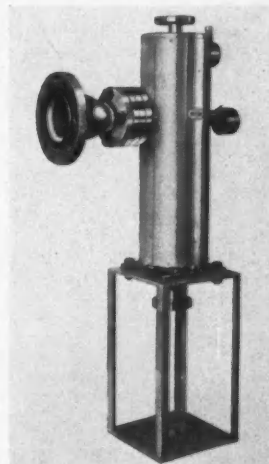
Catalytic units of the type shown by the **Baker Platinum Division, Engelhard Industries Ltd.**, 52 High Holborn, London W.C.1, are designed to promote reaction between nitrogen oxides and hydrogen, hydrocarbons or certain other fuel gases, to yield nitrogen, water vapour and carbon dioxide. By this means (a) the heat energy of the nitrogen oxide may be recovered, (b) an innocuous effluent is obtained which may be discharged directly to atmosphere.

These catalysts, by virtue of their high activity, are capable of operating at very high space velocities and are therefore economic in usage. Several patent applications are pending with respect to certain new developments made by Engelhard Industries in this field.

Neutron irradiation of both light and heavy water causes splitting of the molecule with formation of the so-called radiolytic gas. In the majority of applications it is essential, for reasons of safe operation and economy, that this radiolytic gas is recombined to form water. The catalytic recombination unit shown makes use of a supported platinum group metal catalyst to promote this reaction at room temperature and above. A unit of this type is used on the A.E.A.'s research reactor 'DIDO', where it is employed to recombine deuterium and oxygen emanating from the dissociation of the heavy water moderator.

Also shown was the application of catalytic recombination units to power reactors of the boiling water type. Here the recombination is applied, in a sealed system, to hydrogen and oxygen carried in a stream of high pressure steam at elevated temperatures. The continued

efficient operation of the catalyst under these conditions raises certain problems such as catalyst stability, corrosion resistance, etc., and these have been studied by the Research Division of Engelhard Industries. As a result of this work



Baker Platinum recombination unit

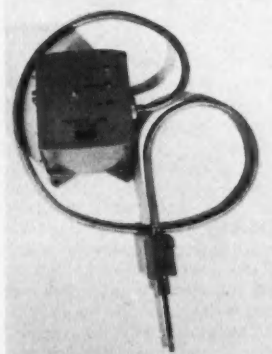
a new type of catalyst is now offered for recombination use in steam at temperatures of around 500°C. The high efficiency of this catalyst permits almost complete reaction; the residual uncombined oxygen after the recombiner is less than 0.1 p.p.m.

B.T.L. Show Prototype Centrifugal Chromatograph

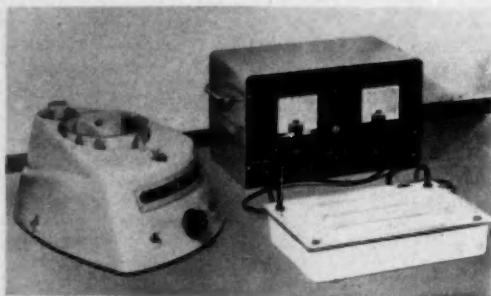
New products shown by **Baird and Tatlock (London) Ltd.**, Chadwell Heath, Essex, comprised a range of equipment for paper chromatography, apparatus for electrophoresis, a prototype bench-type gas chromatograph and a prototype centrifugal chromatograph.

The electrophoretic equipment comprises a horizontal tank, constant current/constant voltage stabilised power unit and a densitometer. The tank unit consists of an opal glass tank, prismatic glass bridge to support paper strips and plate glass lid carrying platinum-sheathed electrodes. Accommodating up to three paper strips 5 cm. wide, each having a separation length of 18 cm., the tank enables separations on starches and gels or for immuno-electrophoresis using Oxoid membranes. Buffer solution capacity totals 480 ml. and interior free air space is kept to a minimum.

The power unit enables several tanks to be operated at once. Nominal output is 500 volts d.c. and maximum current output is 50 mA. The semi-automatic densitometer enables strips up to 18 in. long and 5 cm. wide, mounted on a Perspex cylinder which rotates at a fixed



Proximity detector by Airmec



B.T.L.'s new equipment for electrophoresis, I. to r., densitometer; constant current/constant voltage stabilised power unit; horizontal tank

speed, to be traversed between a light source and a photocell. Optical colour filters can be interposed at will by means of a selector turret. There is a choice of four slit widths and, for fully automatic evaluations, the densitometer can be connected to a chart recorder.

The new B.T.L. chromatographic equipment for paper chromatography includes: strip tank measuring internally 11½ in. by 6½ in. by 23 in. deep; multi-sheet tank, with which 15 two-dimensional chromatograms can be prepared under identical conditions; two dimensional sheet tanks which with the ascending technique take eight chromatograms at once, or six with the descending method; rectangular stoneware cream-glazed tanks; all-glass spray enabling a 250 ml. flat-bottomed flask to be fitted to two types of spray head, differing in volume of aerosol delivered; an electrically heated drying oven with temperature range from ambient to 220°C that will take more than 50 sq. ft. of paper in sizes up to 22½ in. square; and a desalting apparatus with three compartments separated by ion-exchange membranes. Centre compartment has three cells of 1, 2 and 3 ml. capacity.

The prototype B.T.L. bench-type gas chromatograph uses nitrogen, hydrogen or helium as the carrier gas and operates at temperatures from ambient to 250°C. Columns can be rapidly withdrawn and changed.

The prototype centrifugal chromatograph enables separations to be made on filter paper. A driven spindle attached to a disc of filter paper can be driven at speeds varying from 300 to 2,000 r.p.m. Compounds to be separated are applied in the form of a spot near the centre of the paper and the application of a continuous flow of solvent to the revolving paper disc results in sharply defined radial separations. Average development time is six minutes. Separation chamber is of glass.

Electrochemical Dissolved Oxygen Analyser

Latest model of the continuously recording electrochemical dissolved oxygen analyser Mk. III (gas-phase transfer type) marketed by **Cambridge Instruments Co. Ltd.**, 13 Grosvenor Place, London S.W.1, employs a novel electrochemical method of detection which is specific for oxygen. It has been designed to meet the needs of high pressure and high temperature systems.

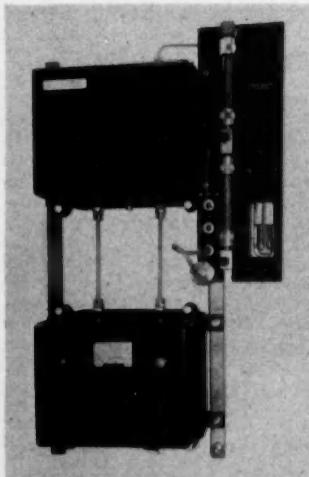
In the new design, glass components have been reduced to a minimum and the

few that remain are easily replaceable. The measuring cell is isolated from interfering impurities in the feed water by the gas phase transfer system, and built-in facilities are provided for establishing zero and for calibrating at the working point. The instrument is self-testing for leakage. The range now supplied is 0 to 0.05 p.p.m. by weight dissolved oxygen.

D.C.L. Magnetic Oxygen Analyser

The **Distillers Co. Ltd.**, Great Burgh, Epsom, showed their magnetic oxygen analyser and metering pumps in a display of equipment for the chemical industry which, at the Brussels World Fair, gained for the company a diploma of honour. The D.C.L. null balance magnetic oxygen analyser was developed for the analysis of oxygen in any mixture of common gases such as flue gas, inert atmospheres and gas process streams. It measures the magnetic susceptibility of a continuously flowing sample, using a novel feed-back system which results in an automatic instrument in which accuracy and rapid response are combined with safety, robustness and insensitivity to flow-rate fluctuations, tilting, shock and vibration. The gas comes into contact with no hot wires or high voltages so there is no risk of igniting explosive or inflammable gas mixtures, nor are any chemicals involved.

Any range from 0-1% O₂ to 0-100% O₂ can be selected with a switch, the limit



Null balance oxygen analyser, by Distillers Company

of detection being 0.005% O₂ or 0.25% f.s.d. (full-scale deflection).

The instrument was shown at the Physical Society Exhibition with the new ultra-rapid D.C.L. multipoint gas sampling panel, which enables gas to be taken from any one of a number of sample lines simply by inserting a bayonet plug into the appropriate socket.

The D.C.L. panoramic temperature display unit displays on a cathode-ray tube the temperature distribution in a chemical reactor or other thermal system. Up to 24 thermocouples are scanned successively during a time period of 1.5 sec.; vertical displacement of the spot representing the temperature of each in turn, the spot being deflected horizontally by a fixed amount each time a thermocouple is switched on. Any desired temperature distribution can be made to give a straight line display so that a deviation at any point may be easily detected. An alarm system can be incorporated.

The D.C.L. range of variable capacity pumps was developed for the accurate metering of small quantities of fluids, in connection with distillation processes, antibiotic research, catalyst injection, water treatment and similar operations where constant pre-set flows are a requirement. Each pump permits an infinite variation of capacity within its range by micrometer adjustment of its stroke which can be made while the pump is working. Non-corrodible materials of construction are chosen to suit the fluid being pumped.

Micro pumps are available in nine sizes from 0-7 ml./hr. to 0-1,500 ml./hr. 'M' pumps are available in ten sizes from 0-750 ml./hr., to 0-37.3 l./hr. and are also available for proportional control in response to a pneumatic signal.

Where fluid is to be handled at elevated or reduced temperature or under sterile conditions, the same range of pumps is available with hydraulically operated diaphragm heads.

New Low-priced Ultramatic Single-pan Balance

Stanton Instruments Ltd., 119 Oxford Street, London W.4, showed an improved model of their Thermo-recording balance, said to be the only commercially available single unit able to weigh continuously at 1,400°C to an accuracy of 1/10,000th part of a gramme. The latest model has straight line response of both recorder pens, a new feature that greatly facilitates the extraction of differential information.

The most prominent of several new instruments on show was an addition to the Ultramatic range of single-pan balances. It is of the 'applied load' design and has a graticule reading 0-1g. in 100 divisions, each division being equivalent to 10mg. with a vernier reading to 1 mg. Model U.M.10 provides an answer to the demand for a low priced single pan balance suitable for routine analytical work. The vernier fitted to this balance is numbered, making it easy to read, a feature which has also been added to model U.M.3.

The aperiodic two pan balance, A.49, with a 10g. weight loading attachment

is now supplied complete with a set of weights from 10-100g., housed in a block placed conveniently near the right hand pan. Thus no box of weights is required for this balance, and a great deal of time is saved in carrying out weighings. On the full weight loading two pan balances models B.20 and B.21, weight loading has been rearranged to give two banks of eight arms instead of three banks as originally. Once again the new balances are designed to speed up weighing operations, and in addition better access is afforded to the beam chamber.

G.E.C. Impermeable Graphites

Recent work at the research laboratories of the **General Electric Co. Ltd.**, Magnet House, Kingsway, London W.C.2, has led to the development of impermeable graphites not subject to the 200°C temperature limitation imposed on normal graphite impregnated with resins and plastics; a demonstration showed a graphite tube heated to nearly 600°C. The tube contains carbon dioxide under pressure and was mounted in an evacuated container. A major use of such graphite would be in nuclear reactors where a graphite-to-metal join may be necessary.

There was a demonstration of apparatus designed to detect impurities in gas-filled incandescent lamps and another showing wave forms in fluorescent tubes.

Molecular Distillation

Three large capacity rotary pumps displayed by **Edwards High Vacuum Ltd.**, Manor Royal, Crawley, were of nominal capacity 30 cu. ft./min., 50 cu. ft./min. and 100 cu. ft./min. These are single stage air ballasted pumps capable of ultimate pressures of about 1 by 10^{-3} mm. Hg (McLeod). They are provided with automatic arrangements to prevent oil suck-back when 'closed down' under vacuum. These pumps permit 'backing' by a smaller single-stage pump, as a standard modification. In this way high vacuum performance approaching that of a two stage pump of large capacity is economically achieved.

In the field of molecular distillation the 2 in. wiped-wall molecular still incorporating rotary vacuum seals, slip rings, thermocouples and rotating wiper blades was exhibited to demonstrate improvements which result in high rates of distillation, from a turbulent film, with consequent short time of exposure to elevated temperatures for the substance being processed.

The molecular weight range of materials that can be processed under molecular distillation conditions (residual air pressure about 10^{-3} mm. Hg) is normally between 200 and 1,200. For materials boiling below 250°C (at atmospheric pressure) provision is made to distill at any convenient residual air pressure from 10^{-3} mm. Hg or less to 0.5 mm. Hg or more.

The apparatus is useful for a number of operations where processing temperatures are high or vapour pressures very low, i.e., distillation, evaporation, desorption, including deodorising and stripping

with or without condensation.

The Speedivac model GD1 leak detector is the production version of a new high sensitivity leak detector applicable to outward leakage from a pressurised system. Samples of air from suspected areas are continuously drawn over an electrically heated element, the temperatures and hence resistance of which change when the tracer gas is present. A leak, producing a local increase of concentration of one part in 10,000, of hydrogen in air can be readily located.

A mass spectrometer utilises a new type of focusing system, based on an axially symmetrical lens, instead of an analysing magnet. The instrument is designed for hydrogen and helium as test gases, but it is particularly sensitive to hydrogen. A special feature is the low hydrogen background obtained even when testing 'dirty' degassing components so that a leak as small as 5 by 10^{-7} lusecs is readily detected.

New E.I.L. Instruments

A record number of new instruments was shown by **Electronic Instruments Ltd.**, Lower Mortlake Road, Surrey. These include new pH meters, prominent among them being the new Vibron direct-reading pH meter which the makers state is designed to be the most advanced laboratory pH meter in the world. Using the exclusive E.I.L. Vibron technique, this instrument provides full-scale readings of 1.4 pH units with a discrimination of 0.005 pH on a precision E.I.L. meter. The zero drift of the instrument does not exceed 0.002 pH units in 12 hours.

The miniature industrial pH meter is designed to suit the modern trend towards the miniaturisation of control panel instruments and it is intended for use with recorders or controllers both of the conventional and miniature type.

A new self-contained portable pH meter is shown for field or laboratory use. Despite its small size, this instrument will measure reliably to 0.1 pH, unlike the miniature or pocket type of pH meter which, in general, has a lower order of accuracy. The small size has been achieved by the use of a printed circuit and transistors which give the added advantage that a single dry battery is all that is required to operate the instrument.

The new Vibron mass spectrometer amplifier, developed on behalf of the U.K. A.E.A., is a fast response electrometer for measuring short pulses of small currents and the high sensitivity and long term stability are due to the use of a special 800 c/s Vibron unit. Another instrument in the series is the Vibron

gamma ray electrometer for determining the density of uranium ore in a slurry.

Among new electrochemical instruments shown was the E.I.L. direct-reading fluorimeter for analysing samples which fluoresce in u.v. light. Also on display was a new SO_2 analyser, developed in conjunction with Associated Ethyl. This apparatus operates on the coulometric principle and can accurately detect concentrations as low as 0.5 p.p.m. SO_2 .

New Components for I.R. Gas Analysers

As manufacturers of infra-red gas analysers, **The Infra Red Development Co., Ltd.**, Welwyn Garden City, Herts, over the last few years have developed a number of components which have been incorporated in gas sampling equipment. These components are now generally available, and among components on show were variable and pre-set throttling valves capable of giving a fine control of gas flow rate at pressures up to 200 p.s.i.; flow controllers to give a constant pre-set flow rate in the range 0.25-1.25 l. per minute with pressure drops varying between 40-300 mm. Hg; pressure relief valves to operate at pressures as low as 2 in. water gauge.

Also shown were absolute pressure regulators to maintain the gas stream in a cell at a constant predetermined pressure. As an example, a pressure of 700 mm. Hg absolute can be maintained with ± 3 mm. Hg for applied pressures between + 5 and - 2 p.s.i.g. and with flow rates varying between 0.5 and 5.0 l. per minute.

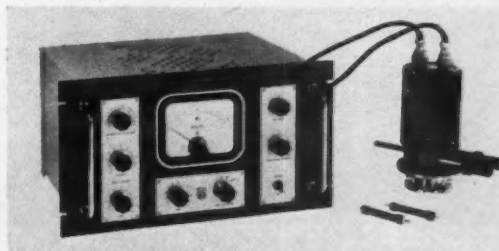
Square-wave Polarograph

Latest form of the Mervyn-Harwell square-wave polarograph shown by **Mervyn Instruments Ltd.**, St. Johns, Woking, is claimed to detect and measure trace elements in the presence of major constituents even at ratios of 20,000 to 1. In its new form, the instrument is built into a console at which the operator sits. Electronically operated for sensitivity, and for convenience in use and completeness, it is said to present a high standard in polarographic instrumentation.

A thermostatically controlled constant temperature bath contains four cells of an improved design, with a novel electrode system incorporating a special mercury pressurisation unit to facilitate maintenance by remote control of a uniform drop time throughout the potential scan range.

Twin dropping mercury electrodes ensure that the process of analysis is not interrupted in the event of an electrode blockage. The cells are based on the Barker design in which the mercury drops fall into a reservoir beneath the cell.

Vibron mass spectrometer amplifier by Electronic Instruments Ltd.



Both the area and depth of the mercury pool anode are unchanged during tests and the distance between the pool and the dropping mercury electrode is constant and reproducible.

Removal of the drops of mercury or amalgam formed during electrolysis gives a number of advantages. The surface of the mercury pool is not physically disturbed, neither is it chemically contaminated by metallic or non-metallic constituents carried down by the mercury drop. Electrode disturbances are eliminated and the volume of the pool is unchanged. Also, the anodic potential of the pool is less susceptible to variations during polarographic tests.

At the rear of the unit a cylinder supplies oxygen-free nitrogen for use where ultimate sensitivity is required. For anodic polarography, anodic potentials can now be directly recorded on the chart during analysis.

It is possible to determine minor constituents and impurities at levels of 0.001% in sample weights of 20 mg. Little pretreatment of the sample is generally needed compared with classical polarography. Mixtures of widely varying concentrations can be readily analysed simultaneously.

Modifications to G. and G. V.P.C. Apparatus

The Griffin V.P.C. apparatus Mark 2b shown by Griffin and George Ltd., Alper-ton, Middx, is a development of the model exhibited at the 1958 exhibition. The temperature of operation has been extended to permit the resolution of mixtures having boiling points up to 375°C at atmospheric pressure.

This model incorporates two electrically-heated ovens each with independently controlled accelerated thermostat and motor-driven fan for mechanical air convection. Each oven has independent control and measurement of carrier gas flowrate thereby permitting simultaneous use under identical or different operating conditions of the two columns housed in the separate ovens; the operator selecting the appropriate time for switching of the recording potentiometer to record parti-



V.P.C. apparatus by Griffin and George

cular sections of the individual chromatographic separations.

Method of detection (by thermal conductivity measurement) permits the collection of individual components from the resolved mixture; a fraction collecting device, manually operated, being fitted to the apparatus for this purpose. A modified bridge control unit allows a wide range of attenuation of detector signal, thereby increasing the scope of the instrument.

For the analysis of components gaseous at ambient temperature, a gas sampling device is used to introduce them into the apparatus. This gas sampler is manually operated, requires no lubrication; and has interchangeable sample columns for use with mixtures of diverse complexity and composition.

X-Ray Microanalyser for Quantitative Chemical Analyses

Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester 17, featured an X-ray microanalyser, which enables quantitative chemical analyses to be performed with small volumes (about 1 cu. micron) of material employing the technique developed in France by Castaing. Developed by the A.E.I. Research Laboratory at Aldermaston, it is the prototype of production models now being constructed by Metropolitan-Vickers.

A fine electron probe irradiates a minute portion of the specimen and the resulting X-radiation is examined using a crystal spectrometer. A quantitative analysis is carried out by the use of a radiation counter and recorder. Elements ranging from uranium to titanium are readily detected, but compounds containing the lighter elements may be analysed by a proportional counter and a pulse height analyser, which are incorporated in the equipment.

The equipment comprises three main items. First, the console which incorporates the electron probe, spectrometer, optical microscope, and vacuum equipment; secondly, high voltage supplies and electron lens supplies cubicles; and finally, a recording cubicle.

The spectrometer uses a bent crystal, normally lithium fluoride, and incorporates an automatically-positioned lead screen which prevents direct entry of X-radiation into the Geiger-Muller tubes when operating at low Bragg angles. The recording equipment consists of a combined scaler and ratemeter; the scaler is used for preliminary adjustments and analyses, while the ratemeter is used for more accurate work. A continuous record of the distribution of an element in the specimen is displayed on a strip chart recorder driven by the ratemeter while the specimen is scanned mechanically.

The 700× or 800× metallurgical microscope, fitted with a wide angled eyepiece, is used to view the specimen and select the micro area for analysis. When this area is central in the field of view, the specimen stage is rotated to 180° and the desired area automatically located under the electron probe: no

further adjustments to the specimen are necessary. The specimen stage holds six specimens, which can be as large as 0.5 cu. in. or secured in ½ in. mounts. Specimen shape is not important, but the surface must be polished as for normal metallurgical work.

Also shown were the MS7 mass spectrometer, a double focusing instrument of the Mattauch type, designed primarily for the analysis of impurities in solids; a 2 in. radius laboratory mass spectrometer, intended for use in applications where it is necessary to determine directly the composition of the gases and vapours in an apparatus without any intermediate sampling; the Raymax, 60 X-ray fluorescence spectrometer, with a constant potential high voltage generator, spectrometer and counting gear; and Metrovac high vacuum equipment.

N.M.R. Recording Spectrometer

In production is the N.M.R. recording spectrometer, type SL44 (Mk. II), produced by Mullard Ltd., Mullard House, Torrington Place, London W.C.1. The equipment comprises a large Ticonal permanent magnet, with a micro-manipulator for positioning the specimen accurately in the gap and electronic apparatus for sweeping the magnetic field and for observing and recording the nuclear resonance spectrum. The chief improvement is the provision of a stronger magnetic field of approximately 9,400 gauss, corresponding to a frequency of 40 mc/s for proton resonance. Bigger chemical shifts are thus obtained, and a stronger signal is produced. The uniformity of the field has also been increased—to a few parts in 10⁶, and the frequency stability is of the same order. The magnetic field may be shifted about the nominal by ±16 gauss and swept through a range of ±2 gauss. Temperature of the magnet assembly is controlled to within 1%.

Although the equipment is designed primarily for proton resonance, it can be adapted for other nuclei. Both the crystal oscillator energising the r.f. bridge and the pre-amplifier are plug-in units, easily replaceable where large changes of frequency are required. Smaller changes (e.g. between hydrogen and fluorine) can be made by changing the oscillator crystal and re-tuning the pre-amplifier.

Preparing Mixed Oxide Powders for Magnetic Ferrites

An electrolytic co-precipitation method of preparing mixed oxide powders for the production of magnetic ferrites was shown by G. V. Planer Ltd., Windmill Road, Sunbury-on-Thames. Advantages claimed are greater economy and simplicity, also increased homogeneity and chemical purity of the mix. Compositions prepared by the process include Mn-Zn, Ni-Zn, Mn-Mg and Ba ferrites.

Also shown was an ignition unit incorporating a liquid-filled polyester resin capacitor for operation over the temperature range -50°C to 150°C. In

the field of dielectrics, these laboratories showed ceramic compositions of sodium niobate with strontium tantalate and non-ferroelectric ceramics of the Bi/St,Ba,Ca titanate class, also examples of titanate ceramic dielectrics produced by oxy-acetylene flame spraying.

X-ray Fluorescent Spectrometer

Two improvements have been made to the Solartron X-ray fluorescent spectrometer XZ.736 by the **Solartron Electronic Group Ltd.**, Thames Ditton, Surrey. These enable elements of atomic numbers below 20 to be analysed and scintillation counters have been substituted for Geiger Muller tubes, to increase sensitivity in relation to counting time.

Potentiometric Recorder for Use with Gas Chromatographs

A potentiometric recorder, with an integration system suitable for use with gas chromatographs was one of the new items shown by **Sunvic Controls Ltd.**, Crown House, Aldwych, London, E.C.2. The integrating system is fitted into a single trace recorder, potential from the retransmitting slidewire of which is fed to a low-inertia integrating motor. Shaft speed of this is directly proportional to the applied potential.

Three sets of cam-operated contacts are included. A pair can be selected according to chart speed, and they make circuit at a frequency proportional to the deflection of the instrument. The contacts energise two solenoid-operated pens which record the time integral of each trace 'peak' immediately beneath the peak. Amplitudes between 10% and 100% f.s.d. can be integrated to better than 1%. Integration starts when the recorder input reaches 1% f.s.d. Output can also be fed to a mechanical counter either internal or external to the instrument.

Unicam Spectrofluorimeter Shown as Prototype

The SP.700 recording spectrophotometer, shown in prototype form at the 1956 Physical Society Exhibition, by **Unicam Instruments Ltd.**, Arbury Works, Cambridge, is now, after several further years of research and development, in full production. The instrument automatically records transmittance or absorbance on a linear wavenumber scale in the range from $54,000\text{ cm}^{-1}$ ($186\text{ m}\mu$) in the ultraviolet to $2,800\text{ cm}^{-1}$ ($3.57\text{ }\mu$) in the near infrared. Radiation sources, a hydrogen lamp for the ultraviolet and tungsten lamp for the visible and near infrared, are mounted in a common housing, and changeover from one to the other is effected by a knob on the front of the instrument.

The Unicam spectrofluorimeter, shown in prototype form, is the first of a series of spectroscopic instruments planned on a unit construction principle, using where possible interchangeable components.

The units concerned are: source unit (a 375 w Xenon in water-cooled housing); primary monochromator (a simple Littrow silica prism monochromator);

photometer unit; secondary monochromator; and detector (a photomultiplier with an electronic system to give null indication of an arbitrary ratio between the two beams).

The spectrofluorimeter allows irradiation of a liquid with monochromatic light of any wavelength within the range $220\text{ m}\mu$ to $1,000\text{ m}\mu$ and measurements of resulting fluorescent light at any selected wavelength within the same range. Hence it is possible to determine an 'excitation spectrum' by measuring fluorescent light at any selected wavelength as a function of the wavelength of the exciting light, or to determine a 'fluorescence spectrum' at any selected wavelength by measuring fluorescent light as a function of the wavelength of the fluorescent light.

For quantitative use the wavelength of maximal excitation is selected and measurement made at the wavelength of maximal fluorescence. Such determinations are much more nearly specific than is possible with filter instruments.

New Apparatus by Towers of Widnes

Additions to the range of instruments and apparatus of **J. W. Towers and Co. Ltd.**, Victoria House, Widnes, Lancs, are the Craig type rotary vacuum evaporator and the fixed condenser rotary film evaporator.

The rotary vacuum apparatus is designed for the rapid evaporation of liquids containing heat sensitive solutes, for recovering solute from relatively large volumes of dilute solution, as, for instance, in chromatography and counter-current extraction work and for evaporating liquids which tend to froth or lump when distilled in conventional apparatus. The liquid to be evaporated is contained in a 1 litre flask which is rotated by a variable speed geared motor in an electrically heated stainless steel water bath with simmerstat temperature control. A second 1 litre flask in a cold water bath acts as the condenser.

The new Towers fixed condenser rotary film evaporator utilises the principle of spreading a thin film of liquid over a large surface area and subjecting it to reduced pressure. It can be used for batch evaporation or continuous feed. The 1-litre roll-sided evaporating flask is rotated by an electric motor or an interchangeable sleeve gland. The static member of the gland is connected to a double coil condenser and a 1-litre receiver flask.

Pye Show New Flow-type pH Electrode Assembly

The Pye argon chromatograph, using the new argon detector originated by Dr. J. E. Lovelock, gives sensitivities some 100,000 times greater than previously obtainable and facilitates the analyses of complex substances. The effects of such variables as temperature, pressure and flow on the detector are so insignificant that the degree of control is set solely by the column requirements.

The new portable pH meter shown by



Pye portable pH meter, No. 11071

W. G. Pye and Co. Ltd., Granta Works, Cambridge, is a self-contained unit, with batteries, direct-reading meter and accessories. The front of the right-hand compartment drops down to provide an electrode stand.

A four-valve amplifier with a large degree of negative feedback enables a robust meter movement to be used and provides exceptional linearity and stability of calibration. The input stage uses an electrometer type of valve which reduces errors due to grid current and input conductance to a very low order.

The scale is $3\frac{1}{2}$ in. in length and reads 2 to 12 pH. This may be extended to 0 to 14 pH by buffer control. Each division on the scale is 0.2pH, readable to at least 0.05pH.

A feature of the new flow-type pH assembly is the extreme ease with which the electrodes may be withdrawn from the flow pot, locked in position and buffered using a relatively small volume of buffer solution. The test solution does not come into contact with any material except glass; stainless steel is used for the remainder of the equipment so as to ensure minimum contamination from industrial atmospheres.

Second World Meeting on Polarography

THE second International Congress of Polarography organised by the Polarographic Society, will be held in Cambridge from 24 to 29 August 1959. The scientific programme will be divided into the following sections: Instrumentation; theory and kinetics; analytical and industrial applications; fundamental studies; biological and medical applications; miscellaneous.

There will be four plenary lectures by world authorities and six section lectures. Contributions will be welcome and details should be submitted to Mr. G. F. Reynolds, Chemical Inspectorate, Ministry of Supply, C. 36 Royal Arsenal, Woolwich, London S.E.18.

Requests for application forms and further details should be sent to Mrs. B. Lamb, B.Sc., Evershed and Vignoles Ltd., corner of Iveagh Avenue, North Circular Road, London N.W.10.

● New magistrates appointed at Stockton-on-Tees include Mr. R. C. DOVER, labour manager for Ashmore, Benson, Pease and Co. Ltd., and Mr. R. E. NEWELL, managing director of the I.C.I. Wilton Works.

● Mr. A. BARCLAY, keeper of the department of chemistry at the Science Museum, South Kensington, London, is to retire on 31 March. Dr. S. E. JANSON, deputy keeper, has been appointed to succeed him from 1 April. Mr. F. GREENAWAY and Mr. W. WINTON have been appointed deputy keepers from the same date.

● Mr. G. K. HAMPSHIRE, chairman of I.C.I.'s General Chemicals Division, and Dr. J. S. GOURLAY, chairman of the Paints Division, have, as stated briefly last week, been appointed to the board of I.C.I. with effect from 2 February. Born



Dr. J. S. Gourlay

in 1900 and educated at Leeds Grammar School and Magdalen College, Oxford, where he gained first class honours in chemistry, Mr. Hampshire joined Brunner Mond—one of the original constituent companies of I.C.I.—in 1923. In 1933 he was appointed sales manager of I.C.I.'s General Chemicals Group, becoming a group director in 1937. Two years later he was appointed managing director of General Chemicals Division and in 1947 became the division's chairman. Dr. Gourlay was born in 1905 at Stevenston, Ayrshire. He went to Stevenston School from 1910 until 1919, when he obtained a post as a laboratory apprentice with Nobels' Explosives at Ardeer. Through a part-time science course he gained a B.Sc., an external degree from London University and was elected an associate of the Royal Institute of Chemistry in 1930. In 1929 he was transferred to the Stowmarket factory of Nobel Chemical Finishes Ltd., and in 1935 he was awarded a Ph.D. from London University for a thesis on the 'Viscosity relationship of nitrocellulose solution.' Dr. Gourlay was appointed an assistant development manager of Nobel Chemical Finishes in 1938 and after it became the Paints Division of I.C.I. he became research manager in 1945. Two years later he was appointed to the Paints Division board as research director. In 1952 he was transferred to I.C.I. Plastics Division as joint managing director, returning to Paints Division as chairman in 1957.

● Sir David Anderson, director of the Royal College of Science and Techno-

PEOPLE in the news

logy, Glasgow, is to retire at the end of the present session. This intimation was made at a meeting of the governors of the college last week. Sir David was principal of the College of Technology in Birmingham for 15 years, when he was appointed head of the Royal College of Science and Technology in 1946. He served an engineering apprenticeship with the North British Locomotive Co. Ltd.



Dr. R. P. Linstead, left, rector of the Imperial College, who received a knighthood in the New Year Honours (C.A., 3 January, page 14). Right, Dr. T. L. Cottrell, personal assistant to Sir Ewart Smith, an I.C.I. deputy chairman, who becomes professor of chemistry, Edinburgh University in September (C.A., 20 December, page 1036)

● Mr. HUGH D. BINYON, instrument sales director of the Solartron Electronic Group Ltd., Thames Ditton, Surrey, is in India to attend the Indian Science Congress and to be present at the group's stand at the exhibition held in association with the congress. Solartron are in the course of forming a company in India together with Indian interests.

● Mr. ARNOLD CARR, deputy chairman of Thos. W. Ward Ltd., Albion Works, Sheffield, has been appointed chairman of three Ward subsidiaries: Thomas Smith and Sons (Rodley) Ltd., Rodley, near Leeds, John Smith (Keighley) Ltd., Keighley, Yorks, and Widnes Foundry and Engineering Co. Ltd., Widnes, Lancs.

● Mr. J. ARTHUR REAVELL, M.I.Mech.E., M.I.Chem.E., F.I.M., chairman of the Kestner Engineering and Evaporator Co. Ltd., and Mrs. REAVELL left Southamp-

ton on 8 January for a tour of the Kestner South Africa Co. offices and associated plants. They arrived at Cape Town on 23 January, and proceeded to Johannesburg. They will later visit Durban and Pietermaritzburg, then return to Johannesburg and finally leave Cape Town on 20 March, arriving back in England on 3 April.

● Sir WILLIAM SCOTT and Sir RICHARD BELLINGHAM GRAHAM have been appointed directors of Head Wrightson Teesdale, the largest subsidiary of Head Wrightson and Co.

Obituary

MR. DONALD DUNDAS, who died on 12 January in a Dumfries nursing home, was well known in the Scottish chemical trade. He had been associated for many years with Dundas Chemical Co. (Mossbank) Ltd., Dumfries.

MR. GEORGE HENRY FRASER, who died on 14 January, had been chief chemist of the chemical sundries factory of the Scottish Co-operative Wholesale Society, Glasgow, since 1923. He was due to retire on 23 January after 50 years' service, but was taken ill at a function at which he received the society's scroll commemorating his long service.

MR. ALEXANDER MURRAY, who was chief blast-furnace chemist in the Clyde Ironworks of Colvilles Ltd., with whom he had served for 42 years, has died aged 63 years. In 1916 he joined James Dunlop and Co. Ltd., as a laboratory assistant at Calderbank and transferred to the Clyde Ironworks in 1923.

Prime Minister Visits Billingham Works



Prime Minister, Mr. Harold Macmillan, who last week toured the Billingham works of I.C.I., is seen here meeting Mr. C. Hammond, a leading-hand fitter. The visit was the first to the Billingham works by a British Prime Minister since the late Ramsay MacDonald opened the oil works in 1935

I.C.I. ENGINEERS DISCUSS TREATMENT OF WATER FOR HIGH PRESSURE BOILER PLANT

At the Wilton Works, Middlesbrough, of Imperial Chemical Industries Ltd., high pressure boilers combined with a back pressure turbine installation, supply steam and electricity for operation of the chemical plants. The direct usage of steam in certain of the chemical manufacturing processes, and unavoidable losses of condensate due to contamination, result in heavy demands for treated water for boiler feed purposes. Raw water of potable quality and raw water blended with fresh water are treated to produce 1.3 million gall. per day of feed water suitable for boilers operating at 950 lb./in.² gauge and 1,700 lb./in.² gauge. In a paper delivered at a meeting of the Institution of Chemical Engineers, in London on 6 January, J. Arthurs, J. A. Robins and T. B. Whitefoot, of I.C.I. Wilton Works, described the treatment processes and methods of boiler water conditioning and reviewed the associated boiler and generating plant operating experience.

The boiler plant at Wilton comprises three Babcock and Wilcox 'High Head' boilers raising steam at 950 lb./in.² gauge and a fourth Babcock and Wilcox 'Radiant' boiler raising steam at 1,700 lb./in.² gauge. A fifth Babcock and Wilcox boiler to operate at the same gauge as the fourth is still under construction. All the boilers are coal-fired.

Proportion of Make-up Water

In the feed water supplied to the 950 lb./in.² gauge boilers, the proportion of make-up water varies from 40 to 65% of the total feed, the remainder being condensate recovered from the factory, condensate from turbine condensers and condensate arising from feed heating. The treated make-up is produced in No. 1 water treatment plant feed water for the 1,700 lb./in.² gauge boilers contains a higher proportion of treated make-up water (from No. 2 water treatment plant) and no condensate returned from process plants.

Raw water supplies are obtained in bulk from two systems operated by the Tees Valley and Cleveland Water Board. The Tees Valley water is of medium hardness content and can contain dissolved organic matter from the peaty soil in the gathering grounds. The Worsall water (untreated fresh river water) varies widely, depending on the flow-rate of the river. The Tees Valley water is normally used for preparation of boiler make-up, although the Worsall water may be used if conditions necessitate it (Table 1).

To achieve the conditions outlined in Table 2, feed treatment would comprise the continuous addition of sodium sul-

phate, caustic soda, sodium sulphite, and a small amount of tannin into the discharge from the pressure deaerators, together with intermittent addition of a disodium phosphate-tannin solution direct into the boiler drum. Control of dissolved solids concentration would be maintained by operation of the continuous blowdown system with use of the intermittent blowdown system as required to control the suspended solids content at a low level.

Total Dissolved Solids. To allow for variations in boiler loading and also for any margin of error in operation of the blowdown system, a working range of total dissolved solids of 700-1,000 p.p.m. (850 p.p.m. mean) was adopted.

Control of Alkalinity in Feed Boiler Water

Alkalinity Control. A pH value of 8.5 to 9.5 was selected for the feed water for protection of feedline and feed heating equipment and a pH of 10.5 to 11.5 for boiler water. It was decided to maintain a total alkalinity in the boiler water of the order 15% of the dissolved solids concentration with a free caustic alkalinity of the order of 100 p.p.m., the remainder being in the form of sodium phosphate alkalinity.

Sodium Sulphite. The range of sulphite reserve in the boiler water was fixed at 20 to 40 p.p.m. Provision was made for mechanical deaeration of feed water to a low level of dissolved oxygen content.

Sodium Phosphate. A level of 100 to 140 p.p.m. sodium phosphate in boiler water was adopted in order to counteract any residual hardness in treated make-up or returned process condensate. It was also desired that part of the boiler alkalinity should be in the form of sodium phosphate alkalinity.

Sodium Sulphate. Because of reports that rolled tube ends and similar areas under stress might be subject to caustic embrittlement attack, a suitable sulphate/alkalinity ratio in the boiler water based upon A.S.M.E. recommendations was maintained.

Silica. U.S. operators had suggested that provided silica in steam did not exceed 0 to 1 p.p.m., turbine deposits would tend to be soft and units would continue to run satisfactorily for long periods. Silica volatilisation had been encountered, however, is one of I.C.I.'s boiler installations operating at 800 lb./in.² gauge with a boiler water containing 20 to 80 p.p.m. of silica, but the resulting deposits were soft and easily removed. An upper limit of 40 p.p.m. was therefore adopted for the Wilton 950 lb./in.² gauge boilers. The silica concentration in steam would not exceed 0.1 p.p.m.

Choice of Treatment Plant. Main technical factors to be taken into considera-

tion were: the quality of the raw water available; the quality of feed water required, a low level of hardness being essential; the high percentage of make-up water required; and a desire that the continuous blowdown rate should not normally exceed 10%.

Analytical data on the raw water supply indicated that high silica content in the raw water would only occur infrequently and could be controlled by increasing the rate of blowdown.

The choice of treatment was narrowed to two processes—the demineralisation process and the acid-base exchange (A-BE) process. These authors stated that the latter is cheaper both in first cost and running cost, but produces a water having a solids content of 30 to 50% that of raw water, and having a hardness content of the order of 4 to 5 p.p.m. CaCO₃. It was decided to install the demineralisation process because of the high proportion of make-up water required.

No. 1 Water Treatment Plant. This consisted of three cation units, each 7 ft. 6 in. dia. by 7 ft. 6 in. high, charged with a carbonaceous zeolite exchange material, and three anion units, each 6 ft. dia. by 7 ft. 6 in. high, charged with a weakly basic condensation-type anion exchange material. Cation and anion units are regenerated with sulphuric acid and soda ash solution respectively, and provision is made for neutralisation of waste effluent before disposal to drain. Carbon dioxide is removed from the demineralised water in an air-blown packed tower and the demineralised and decarbonated water collected in bitumen-lined concrete storage tanks. All the equipment from the cation units to the decarbonator is fabricated in rubber-lined mild steel, and to protect equipment handling the water at subsequent stages, provision is made for the controlled injection of caustic soda after decarbonation to raise the pH to approximately 7.0 to 7.5.

Meeting Higher Demands for Steam

Later, with increased factory steam demands an A-B-E section capacity 75 m³/h average output was added to No. 1 treatment plant. This extension consisted of one cation unit and a 6 ft. dia. by 7 ft. 6 in. high base exchange unit, together with a second air-blown decarbonator. The plant was further extended by addition of a fourth pair of demineralisation units, thus increasing the totalled capacity of this plant to 215 m³/h (i.e. 140 m³/h DM and 75 m³/h A-B-E).

Boiler Feed Conditioning. Solutions of conditioning chemicals are added continuously to the feed water stream after the deaeration stage. The feed conditioning chemicals originally added were caustic soda, sodium sulphate, sodium sulphite, and a small amount of tannin. Addition of sodium sulphate was discontinued, however, and the amount of sodium sulphite added was reduced to maintain a concentration of about 15 p.p.m. in the boiler water.

Sodium phosphate as a solution of

TABLE 1
Analysis of Raw Waters
Tees Valley water supply

Supply	Range		Mean		Worsall water supply	
					Range	Mean
pH	6.9	7.8	7.2		6.5-9.2	7.7
Total hardness (CaCO ₃)	40	180	80		46-356	150
Total Alkalinity (CaCO ₃)	32	120	65		24-212	107
Sulphate (SO ₄)	7	35	15		11-119	54
Chloride (Cl)	8	17	10		12-70	25
Silica (Total)	1.2	6	3.0		2-56	10
Silica (Dissolved)	0.05	5.9	2.5		1-27	7
T.D.S. at 105°C	68	194	113		85-485	230
Suspended solids at 105°C	1	10	2		1-223	38
Organic matter (permanganate equivalent)	0.5	6	3		1-8	4

either the disodium salt or hexa-meta-phosphate with a small amount of tannin is injected separately into the boiler drum every four hours. Direct injection of phosphate is preferred because of the possible danger of deposition of basic calcium phosphate in the economisers.

Steam Purity. Each of the 950 lb./in.² gauge boilers is equipped with cyclone steam separators and spray separators in the boiler drum. The purity of the steam is monitored. Check tests carried out over the past four years using an apparatus devised in the company for continuous evaporation of steam condensate have indicated that the solids content of the steam is normally 0.4 p.p.m. or less, a portion of which is iron oxide. The steam also contains ammonia (originally present in process condensate) and carbon dioxide (about 1 to 2 p.p.m.) presumed to result from hydrolysis of sodium carbonate present in the boiler water. With the upper level of silica in boiler water set at 25 p.p.m., the silica content of the steam is of the order of 0.05 p.p.m.

Operating Experiences. Demineralisation and acid-base exchange sections have maintained their rated outputs when handling raw water. During summer months a fall in the exchange capacity of the cation resins, coupled with a deterioration in the quality of the treated water has been observed. An increased pressure drop also occurred and it was found that a hard 'crust' had formed on the upper layer of the beds. The 'crust' was composed of alumina, inorganic and organic water coalesced with fine exchange material, with some iron bacteria also present.

This 'seasonal' problem is solved by backwashing at increased rates and for longer times during the regenerative cycle. An extra backwash is also carried out half-way through the cycle if a unit has been operated intermittently. The build-up of microbiological organisms is due to the increased quantities of colloidal and suspended impurities in the water in the summer period.

A gradual falling off in performance on the anion side has been noted. Backwashing and longer regeneration cycles produced no improvement. Exchange capacities improved, however, when units were operated at throughputs below the design rate. Deterioration of these units is believed to be due to organic matter present in the raw waters.

After two years of operation the two 950 lb./in.² gauge boilers showed some corrosion in the primary superheater tubes. This was considered to be due to oxygen in the steam and possibly carry-over traces of boiler salts. The performance of the deaerators was modified, adjustments were made to the steam and

spray separators, and the water level in the drum maintained between close limits. As a direct result of the improved deaerator performance, the sodium sulphate reserve in the drum was reduced to 15 p.p.m. As the boiler drums were welded and stress-relieved, addition of sodium sulphate was discontinued. Periodic inspection is made of the state

TABLE 2
950 lb./in.² gauge Boilers
Specified Boiler Water Composition

	Range (p.p.m.)
Total dissolved solids	700-1,000
NaOH	80-120
Na ₂ CO ₃	100-140
Na ₂ SO ₄	20-40
Na ₂ SiO ₃	At least 2.5 times total alkalinity expressed as NaOH
SiO ₂	Less than 40
Suspended solids	Not to exceed 10% of T.D.S. concentration

TABLE 3
950 lb./in.² gauge Boilers
Typical Analyses of final feed water and boiler water

Constituent	Average composition (August 1957)	
	Feedwater (p.p.m.)	Boiler water (p.p.m.)
pH	9.3	11.5
Total hardness (CaCO ₃)	0.4	106
NaOH	4	55
Na ₂ CO ₃	1	14
Na ₂ SO ₄	—	178
Na ₂ PO ₄	—	125
Chloride (Cl)	3.5	47
Suspended solids	—	8
Silica (SiO ₂)	1.1	23
Total dissolved solids at 105°C	35	745

TABLE 4
950 lb./in.² gauge Boilers
Steam Purity

	Average composition (Aug. 1957)
pH	6.0
Conductivity (degassed sample)	1.5 (m.h.o.)
Carbon dioxide	1.8 (p.p.m.)
Ammonia	0.2 (p.p.m.)
Silica	0.05 (p.p.m.)

TABLE 5
1700 lb./in.² gauge Boiler
Specified boiler water composition

	Range (p.p.m.)
pH	10.5-11.5
NaOH	20-30
Na ₂ PO ₄	10-20
Silica	2-3
Na ₂ SO ₄	2-3
Total dissolved solids	Less than 500

TABLE 6
1700 lb./in.² gauge Boiler
Typical Analysis of boiler water

Constituent	Average Composition (Feb. 1955) (p.p.m.)
NaOH	25
Na ₂ CO ₃	5
Na ₂ PO ₄	17
N ₂ H ₄	0.01
SiO ₂	2
Total dissolved solids	70

TABLE 7
1700 lb./in.² gauge Boiler
Steam Purity

	6.2
pH	1.3 (m.h.o.)
Conductivity (degassed sample)	0.5 (p.p.m.)
Carbon dioxide	0.03 (p.p.m.)
Ammonia	0.03 (p.p.m.)
Silica	0.03 (p.p.m.)
Hydrogen	0.001 (p.p.m.)

of bolted flanges on the external blow-down lines. Caustic cracking at these points has not been noted so far.

Sodium sulphite has been replaced by hydrazine as an oxygen scavenger. A concentration of 0.01 to 0.02 p.p.m. has been maintained. Operating experience has also led to the decision that acid-cleaning (using hydrochloric solution) of boilers can be carried out at regular intervals with advantage.

With a silica content of 0.07 to 0.1 p.p.m. in the saturated steam from the boilers, light deposits occurred in the secondary turbines, containing about 60% silica were fairly soft and easily removed. Later with a higher silica content in the make-up water to the boilers, the average silica content in the boiler water was about 40 p.p.m. with between 0.11 and 0.13 p.p.m. in the steam. Heavy deposits, therefore, occurred in the sections of the turbines operating between 105 lb./in.² gauge and 20 lb./in.² gauge consisting of 84 to 90% silica and 6 to 12% of a mixture of ferric and magnetic oxides of iron. The upper permissible limit of silica concentration in the boiler drum was reduced to 25 p.p.m. This figure, it is thought, may still be too high.

Water Treatment Conditions for 1,700 lb./in.² Gauge Boilers. A maximum concentration of about 500 p.p.m. of dissolved solids in the boiler drum and a normal operating concentration of 200 to 400 p.p.m. was adopted. The silica concentration in the boiler water has to be limited to 2 to 3 p.p.m. to minimise the risk of turbine-blade fouling. Efficient mechanical deaeration of feed water to a very low level of dissolved oxygen content is necessary and it is desirable that the concentration of free caustic alkalinity and phosphate in the drum be kept at a low level.

Conditioning Process

Steps adopted in the boiler feed water conditioning process were:

(a) Two-stage deaeration (vacuum and pressure) to reduce dissolved oxygen content of feed water to 0.005 p.p.m.; (b) continuous addition of caustic soda and addition of an oxygen scavenger (i.e. sodium sulphite and/or hydrazine) after deaeration; (c) intermittent addition of disodium phosphate directly to the boiler drum.

No. 2 Water Treatment Plant. The two-stage deionisation process with intermediate degassing was selected. Plant of capacity 200 m³/h continuous output, incorporating clarification and deionisation sections was installed. The clarification section includes provision for flocculation by means of coagulants (alum and acid), sedimentation, and filtration through rapid gravity filters. The deionisation system includes in series a set of three 12 ft. dia. by 12 ft. straight-side cation exchange units charged with high capacity sulphonated polystyrene exchange material, a vacuum degasser and a set of three 12 ft. dia. by 12 ft. straight-side anion exchanger units charged with quaternary strong base anion exchange materials. Cation and anion units are regenerated with hydrochloric acid and caustic soda respectively.

Provision is made for neutralisation of waste effluent liquors. Sodium flame photometers and silicometers are used to monitor the quality of the water produced. Present capacity of this plant is being extended to 370 m³/h continuous output to provide the additional treated water for the 1,700 lb./in.² gauge boiler.

Boiler Feed Conditioning. The conditioning chemicals, hydrazine and caustic soda, are added continuously to the feed water and disodium phosphate solution is injected direct into the boiler drum every four hours.

Operating Experience With No. 2 Plant. The plant continues to deliver treated water of the quality and quantity desired. Silica content of the deionised water has been maintained at 0.03 to 0.04

p.p.m. Although organic matter is kept down to about 1 p.p.m., the strong base anion exchange materials have shown darkening in colour suggesting organic fouling may be occurring. Blowing down intensively has stopped pick-up of silica in the boiler water (desired silica level—2 to 3 p.p.m.). Dissolved oxygen concentrations in the feed water are 0.005 p.p.m.

For the new cyclone-fired boiler, in addition to the usual steam purification devices, the saturated steam is to be scrubbed with incoming feed water of low silica content. This should reduce the silica content from that in equilibrium with the silica in the boiler water to something approaching that in equilibrium with low silica-content feed water.

M.E.R.L. Report on Measurement of Large Water Flows

FOUR methods of measuring the rate of flow of large quantities of water in pipes have been tried simultaneously by the Mechanical Engineering Research Laboratory, East Kilbride, Glasgow, in a 40-in. pipeline at flow rates up to 27,000 g.p.m. The tests have given useful information about the relative accuracy and convenience of use of each method under field conditions.

With current-meter and pilot-tube methods the bulk flow is obtained from measurements of the local velocity at specified points across a section of the pipe. By selecting these points in a new way the flow rate can be obtained from measurements at fewer points than standard methods, with at least as great an accuracy in the final result. Current meters are small propellers mounted on low-friction bearings; their speed of rotation depends on the local velocity. Electronic equipment has been developed for automatically recording the number of revolutions, in a known time, of up to 21 current meters. The flow rate can then be calculated within a few minutes of the measurements being taken.

Salt-velocity and salt-dilution methods give the mean flow directly. In the salt-velocity method a quantity of salt solution of higher electrical conductivity than that of the water is suddenly injected into the pipeline and its passage is timed between two downstream positions a measured distance apart. Improved injection gear and detecting electrodes have been developed. In the salt-dilution method a salt solution of known strength is pumped continuously into the pipe at a steady rate. Samples are taken at a downstream position where mixing is complete and their concentration is compared with that at the injection joint. With this method the dimensions of the pipe do not have to be measured.

Further information is given in 'M.E.R.L. Fluids Report No. 65', available from the laboratory.

Hydraulic Relief Valves. A promising new method is also being developed at M.E.R.L. to provide hydraulic engineers with the basic data needed to design relief valves with a given performance.

A relief valve should open at a pre-set

pressure, it should open as quickly as possible without imposing shock loads on the circuit, and it should not oscillate and cause noise while it is open. Tests on eight commercial valves showed that the circuit in which the valve is used has a very marked effect on its characteristics. Under the test conditions none of these valves met all the above requirements satisfactorily.

The method being tried out at M.E.R.L. is to stimulate electrically the characteristics of the components of a hydraulic circuit. For example, the orifice of a valve can be considered as a resistance, and the mass of fluid above the valve piston as an inductance. Calculations have been carried out for the electrical equivalent of a simple, but typical circuit consisting of a supply tank, a positive-displacement pump, and a flow-control valve, with the relief valve between the pump and the control valve. The circuit equations indicate whether the valve is adequately damped and give the correct stroke for a given rate of flow; the response time of the circuit can also be derived.

Further information is given in: 'M.E.R.L. Fluids, Note No. 53', available from the laboratory.

World Literature on Heat Transfer. Twelve thousand references to published papers and books on all aspects of heat transfer and related subjects are included in 'Heat Bibliography 1955-56', copies of which are available. It contains references to heat transfer by conduction, convection and radiation; boiling, condensation and evaporation; heat exchangers of various kinds; and physical properties such as entropy, specific heats, thermal conductivity and viscosity.

Harwell Course for Senior Technical Executives

Next course for senior technical executives in industry at the Harwell Reactor School will be held from 15-25 June. Fee for the course is fifty guineas exclusive of accommodation. Application forms and details are available from the principal at the Atomic Energy Research Establishment, Harwell, Didcot, Berks.

O.C.C.A. Conference to Survey Polymers

TECHNICAL sessions at the 1959 conference of the Oil and Colour Chemists' Association will be held under the general title 'A survey of polymers' in the North British Hotel, Edinburgh, from 5 to 9 May. Papers have been arranged by Dr. J. B. Harrison, hon. research and development officer, as follows:

'Organo-phosphorus polymers,' by Dr. A. F. Childs and Dr. H. Coates; 'The toxicity of some cross-linking agents,' by Dr. M. A. C. Williams; 'Polymers containing fluorine,' by Professor R. N. Haszeldine and Dr. R. E. Banks; 'Chemistry of the deterioration of synthetic polymers,' by Dr. N. Grassie; 'Some aspects of polyurethane chemistry,' by Dr. R. J. W. Reynolds and Dr. H. Gudgeon; 'Polysulphide coatings and sealants,' by W. H. Stevens; 'The experimental approach to the production of applicable boron polymers,' by Dr. W. Gerrard; 'The structural requirements of film forming polymers,' by T. R. Bullett and A. T. S. Rudram; and a paper by Dr. J. S. Long.

Professor E. L. Hirst, professor of organic chemistry, Edinburgh University, will preside. Registration fee for members is 3½ guineas and for non-members 4 guineas. Full details are available from Mr. R. H. Hamblin, O.C.C.A. general secretary, Memorial Hall, Farringdon Street, London E.C.4.

Revised B.S. For Analysis of Coal

In the revision of B.S. 1016: 1942, the series of analytical and physical tests are now being issued as separate parts, of which the first have already been published. Part 6, now issued, 'Ultimate analysis of coal' B.S. 1016, Part 6, 1958, deals with the determination by specified methods of the major constituents of coal.

Those referred to are carbon, hydrogen, nitrogen and sulphur. The Liebig method for carbon and hydrogen has been slightly modified from that given in the 1942 edition and the use of oxygen only for combustion is now specified, particularly for a new high temperature (1,350°C) alternative method. In the macro Kjeldahl method for nitrogen, the use of selenium as an alternative catalyst is now permitted; a quicker semi-micro Kjeldahl method has also been introduced.

The Eschka method for sulphur has been re-examined and improved, and an alternative high temperature method has been added for use when numbers of samples have to be analysed or when results are required urgently. In the determination of carbonates the volumetric method has been replaced by gravimetric and manometric methods which are simpler and more accurate.

Copies of this B.S. may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London W.1, price 10s.

Overseas News

SINCAT PLAN LARGE-SCALE EXPANSION OF PETROCHEMICAL ACTIVITIES IN SICILY

SINCAT (Societa Industriale Catanese), affiliate of Compagnia Edison, are expanding their activities in Sicily. These activities are based to a great extent on a cracking plant near Siracusa (Sicily) which processes petroleum obtained from the Rasiom Refinery in Augusta to produce olefins, in particular, ethylene and propylene. Most of the ethylene produced will be utilised by Celene, another affiliate which is building another plant at Priolo Gargallo not far away. This plant will produce polythene and such widely used derivatives as ethylene oxide, ethylene glycols, etc.

SINCAT have also built plants to process rock salt in which Sicily is very rich. The chlorine thus obtained will be used, together with surplus ethylene and potassium chloride, for the production of solvents, detergents, and additives for motor fuels. Propylene will be used for the production of propylene tetramer which, in its turn, will be utilised in the production of detergents.

The plant at Priolo will process large quantities of potassium salts discovered by the company at S. Caterina Villermosa (not far from Caltanissetta) in order to produce compound fertilisers containing nitrogen, P_2O_5 , and potassium. The output of such fertilisers is to expand to 350,000 yearly tons. At present SINCAT produce daily 800 tons of sulphuric acid, 235 tons of nitric acid (which will be increased to 470 tons at an early date), 240 tons of ammonia, and 240 tons of ammonium sulphate.

It is planned to expand all these plants.

Canada Steps up Sulphur-from-Natural-Gas Output

Reviewing new developments in Canada, Mr. Leonard Hynes, vice-president of Canadian Industries Ltd., Montreal, recently said that progress had been made in the construction of facilities for the production of high-density polythene and polyacrylonitrile for the first time in Canada.

The use of chemical processes to upgrade waste material was expanded during 1958; in Quebec province, lignin chemicals from waste woodpulp liquors; in Ontario, urea from coke oven gas, waste nitrogen and blast furnace gas; and in Alberta, sulphur from sour natural gas. The output of sulphur from that source trebled between 1956 and 1957 and further increases occurred in 1958 as a result of the rising volume of natural gas production, from which sulphur was being removed by large plants at Pincher Creek, Alberta, and Fort St. John, B.C.

It is estimated that by 1965, annual output of sulphur from natural gas in

West Canada might reach 1.5 million tons; nearly 15 times as much as in 1957 and greatly in excess of the present rate of Canadian consumption of sulphur. Transport costs have an important bearing on the degree to which sulphur from this source can displace imported material.

Dutch Plastics Marketing Board Set up

The plastics marketing board planned by the Dutch Government concern Staatsmijnen, of Limburg, and the company Algemene Kunstzijde Unie (see *CHEMICAL AGE*, 13 September, p. 446) has now been set up under the name of Verenigd Plastic-Verkoopkantoor N.V. in Zeist. The company which will concern itself with trading in plastics, plastics machinery, etc., will have a capital of fl.1 million (approx. £100,000).

Canadian Vinyl Industry Faces Stiff Low-cost Competition

The Canadian vinyl industry could only obtain relief against foreign imports if realistic tariffs were established and if, at the same time, foreign producers were required to make a profit over their full costs. This was stated recently by Mr. G. M. Hale, vice-president of Canadian Resins and Chemicals Ltd., a subsidiary of Shawinigan Chemicals. However, where Japan and other countries with low wage rates were concerned, even those measures might not afford a complete solution. Mr. Hale added that the domestic industry was being forced to share an already limited market with countries having much larger facilities and lower costs.

Egyptian Contract for Extensions to Synthetic Fertiliser Plant

The French-West German consortium which in 1956 was granted a contract by the Egyptian Government to erect a large-scale synthetic fertiliser plant in the neighbourhood of the old Aswan Dam has received a further contract for the erection of extensions to the originally-planned plant long before work on the original plant has been completed. The consortium, consisting of the Dortmund firm Friedrich Uhde GmbH, Badische Anilin- und Sodafabrik A.G. of Ludwigshafen and the Compagnie Industrielle de Travaux (CITRA), Paris, has carried out its work so remarkably satisfactorily, says the Egyptian Government, that the further contract was decided upon. The first stage of the DM180 million (£15 million) project has

only just been completed and the whole plant, as originally planned, will not come into operation until spring, 1961, when its initial operation will be 1,300 metric tons of ammonium saltpetre daily.

The additional plant covered by the new contract will cost some DM40 million (£3½ million) extra and will raise production by 400 metric tons of ammonium saltpetre daily.

Colombian Firm to Produce Sodium Silicate

A factory for the production of sodium silicates is expected to start production soon in Colombia. It is stated that the production will be in the vicinity of 9,000 tons per year which will more than satisfy local demand. It is reported that the same company will shortly start construction of a plant for the manufacture of calcium carbide, and that it will be based on a design supplied by a European firm of constructing engineers.

C.I.L. Report 40% Sales Increase in Expanding Polythene Market

Canadian Industries Ltd. forecast a 25% increase in the polythene market this year. In 1958, the company estimates, consumption of polythene resins and compounds rose by 40%. A factor in the sales increase last year was the hula-hoop fad which consumed about 1 million lb. of polythene resins in September and October.

This year, it is expected that film manufacture will continue to be the largest end use, and it also promises to show the largest relative growth. Promising applications for the film are bread wrapping and moisture-proof shipping bags. Blow moulding, C.I.L. say, has up to now been a small outlet for polythene, but in 1959 is expected to consume about 1 million lb. of the polymer as a result of wider uses permitted by improved resins and linings.

Diversey Set up Italian Company

Diversey Italiana S.p.A. has been formed in Milan for the production of detergents and other chemical products.

Russian Synthesis of Alcohol by Oxidation of Paraffins

Four Russian chemists describe in a recent issue (No. 119) of the *Reports of the Scientific Academy of the U.S.S.R.* the synthesis of alcohols produced by the oxidation of normal paraffins in liquid phase. Such alcohols—of secondary type—are, as was reported in the previous of the Academy's Reports (No. 118), produced by the oxidation of liquid n-paraffin at temperatures of between 156° and 170°C by a nitrogen-oxygen mixture (O_2 content: 3 to 4.5%) and in the presence of boric acid.

Resultant alcohols from these oxidations have the same chain structure and the same number of carbon atoms as the original paraffins, say the researchers.

Tests carried out to determine the situation of the hydroxyl-groups in the alcohols produced by the oxidation of n-hexadecane showed that these formed isomeric mixtures of approximately similar molar groups.

As a research method oxidation with red potassium chromate (proportion to alcohol 3:1) and 50%-sulphuric acid (proportion to alcohol—10:1) was carried out, first with ice-cooling and then with use of a water bath. The oxidation was 90% perfect, with the production of the relative amounts of carbonic acid.

Hoechst Heavy Water Process

Hoechst, Frankfurt-on-Main, state that the manufacturing process for heavy water recently put into operation after months of experimental production, is based on the distillation of liquid hydrogen. Heavy hydrogen is concentrated at temperatures of -250°C to 99.8% purity for the heavy water process. The greater part of the plant was manufactured by the Linde's Eismaschinen concern.

Uranium Oxide Sale Prices

During the present series of meetings of the International Atomic Energy Agency two quotations for the supply of uranium oxide were made public. The Union of South Africa offered to supply oxide to the Agency at £3 8s. per lb. of oxide. The material would be in the form of calcined concentrate with a uranium oxide content of about 86%.

The board was informed, however, by the Governor from Belgium, Professor Errea, that the Société Générale des Minerais, a Belgian private company, was prepared to sell uranium oxide with a concentration of 80% at a price of \$8 (£2 17s.) per lb. of oxide contained.

Pakistan's New Fertiliser Plant

Construction has begun on a new fertiliser plant at Multan in West Pakistan. It is expected to cost about \$32 million and is being built by the Pakistan Industrial Development Corporation in co-operation with a group of French companies who have undertaken the project on a turnkey basis. The agreement provides for deferred payment of approximately 75% of the total cost.

Natural gas from the Sui field will be used as the basic raw material. Production capacity will be of the order of 103,000 tons of ammonium nitrate and 59,200 tons of urea by the end of 1960.

Metapolyphenyl Ethers as Base Stocks for Lubricants

Chemists at General Electric, have developed base stocks for hydraulic fluids and lubricants for an aircraft nuclear propulsion system which, according to D. R. Shoultz, general manager of the company's Aircraft Nuclear Propulsion Department (ANPD), can withstand higher temperatures and radiation dosages than any fluid stocks in common use today. This research has been carried

out through ANPD sponsorship, under the Atomic Energy Commission and U.S. Air Force contract.

A small number of possibilities that should be thermally resistant, based on inherently radiation-resistance structure and freedom from unstable groups of atoms was selected. The metapolyphenyl ethers formed one of three series of materials for further development and proved to be the most stable thermally.

These fluids, it is reported, could find applications also in supersonic equipment, such as rockets and space vehicles, wherever temperatures and radiation are critical. They also hold promise as liquid insulation or dielectric liquids in commercial electrical apparatus.

German Firm Expands Fatty Acid Production

On completion of the expansion of their fatty alcohol plant, Deutsche Hydnerwerke, G.m.b.H., Düsseldorf, have started the production of saturated and unsaturated fatty-acid methylesters, as well as increasing production of other fatty acids.

Kohle-Öl-Chemie Postpone Production of Polythene

The three owning companies of the West German Kohle-Öl-Chemie GmbH—Farbwerke Hoechst A.G., Deutsche Erdöl A.G. and Mannesmann-Werke A.G.—are not to start production of polythene at the Kohle-Öl plant as had

been previously planned. Operations are being postponed while new plans connected with the production of polythene are being discussed by the parent companies. Kohle-Öl were to have taken over the supply of polythene to Mannesmann—at present the task of Hoechst. The material is used by Mannesmann in the manufacture of piping.

Italy's Chemical Output Expands

During the period January/October 1958, output of Italian chemical industry increased by 6.3%, compared with increases of a little over 3½% in 1956 and 1957. This increase varies from product to product. Output of ammonia, for instance, rose by 9.8%, while that of tanning extracts went up by 8.3%. At the same time, production of some chemicals showed a reduction; synthetic organic dyestuffs, down by 14%, sulphuric acid, down by 5.1%, and caustic soda, down by 2.6%.

New Analytical Centre Opened in Bavaria

At the Scientific and Technical Work Centre, Weilheim, Upper Bavaria, a new institute has been opened for the study of chemical and physical methods of analysis. Work of the institute is to be made known by a quarterly journal, the first volume of which will deal with the testing of anti-oxidants, a new foil-cell for the investigation of softened foils, and electrometric analysis of solvents.

Shell Chemical Begin Production of Sulphuric Acid from Crude Oil in Australia

PRODUCTION of sulphuric acid as a by-product of the crude oil refining process has begun in Australia at the new plant erected by Shell Chemical (Australia) Pty. Ltd., Geelong, Victoria. This £A700,000 plant is the second petrochemicals enterprise to begin production in Australia (CA, 1958, 80, 1062).

The sulphuric acid produced is to be used as raw material for manufacture of superphosphate, used on a large scale by the Australian wheat industry. It is produced from imported phosphate rock and

locally produced sulphuric acid. The acid is produced mainly from imported sulphur, locally mined pyrites, and from metallurgical refineries.

Output from the new plant will result in a considerable saving in imports of natural sulphur for the acid. Daily output will soon be 100 tons of acid.

The refinery of Shell Refining (Australia) Pty. Ltd. is adjacent to the plant. Nearly 2 million tons of crude oil from the fields of Kuwait and British Borneo, are treated at this refinery.



At an official tour of the Geelong plant are, l. to r., R. D. Cook, refinery manager, H. E. Bolte, Premier of Victoria, T. W. Henderson, managing director, Shell Chemical (Australia), and W. H. Zaaijer, managing director, Shell Refining (Australia)

Commercial News

Borax (Holdings)

Consolidated trading profits, etc., of Borax (Holdings) Ltd. have contracted sharply from £4,147,429 to £3,315,075. After heavier depreciation of £1,536,098 (£1,000,360), there is a balance of £1,778,977 compared with £3,147,069. Consolidated net profits amount to £966,075 compared with £1,881,236 after tax of £499,491 (£1,023,214). There remains a net profit of £573,976 against £1,203,237 attributable to the parent company.

The 8½% dividend on the £9 million deferred ordinary capital is being maintained with a final of 5 5/6% for the year ended 30 September last.

Lord Clitheroe, chairman, refers in his statement to the many difficulties at the new Boron plant of the U.S. Borax and Chemical Corporation, the U.S. operating company. While these have not all been overcome, good progress, he reports, is being made. The situation in the potash world is also difficult. Prices in the U.S. have dropped sharply due to over-production and profits have been squeezed. With regard to the new large Canadian potash field in which the group holds permits, the question of their future is being carefully examined. The immediate future of the U.S. potash industry, states Lord Clitheroe, is far from bright. Borate sales, however, are as great as they have ever been.

British Benzol

Current trading conditions, reported the chairman of British Benzol and Coal Distillation Ltd., Mr. G. H. Johnson, were such that a dividend forecast could not be made for the current year. During the year ended 31 October, total dividend of 10%, less tax, was paid, the final being 5%.

Coke business with blast furnaces, one of the company's mainstays suffered in the early part of 1958, and generally the market had been affected as a result of recession in trade of other important industrial users. The net loss for the year of £28,976 had been partially offset by a non-recurring revenue dividend from a trade investment.

Dussek Brothers

Dussek Brothers and Co., oil refiners and distillers, may pay an interim of 5% and a final of 10% on the capital as increased by one-for-two scrip issue, says Mr. A. W. Thompson, chairman, provided the profits for the coming year are maintained at last year's level and prospects continue satisfactory. The factories at Crayford and Wrexham continue to be fully maintained. Group net profits for 1957-58 was £73,710.

H. J. Elliott

Ten years after H. J. Elliott Ltd., E-Mil Works, Treforest, Glam, introduced their E-Mil brands of volumetric glassware and thermometers in January

- Borax Chairman on World Potash Problems
- 'No Dividend Forecast' — British Benzol
- S.A.I. Profits Doubled at £1.2 Million
- U.S.—B.D.A. Link to Make Textile Chemicals

1949, 40% of the brands are exported direct, apart from exports by Elliott's U.K. stockists and distributors. Demand now accounts for the major portion of the company's overall production capacity, which has been expanded twelve-fold since 1939 and is still expanding. Besides volumetric glassware, H. J. Elliott specialise in liquid-in-glass chemical thermometers, hydrometers and viscometers. It is stated that 1959 will bring further announcements regarding new functional design features.

Great Lakes Carbon

Particulars of a new company, the Great Lakes Carbon International Ltd., were filed in the U.K. on 12 January. Capital is 10,000 shares of Common stock, without nominal or par value. The company was registered in Canada in August 1957 to produce, import, export and deal in minerals, metals, mineral oils, chemicals and by-products. The directors, W. Gramm, George Shakel, Jr., J. C. Shakel, R. W. Shakel and J. Solari, are all resident in the U.S. British address is Suite 9, 140 Park Lane, London W.1.

Bowmans Chemicals

Subject to audit, profits of Bowmans Chemicals for the year to 31 October 1958, is £14,067 (£16,027) after tax of £18,935 (£20,889). A final dividend of 6% is being paid, making a total of 10% for the year.

S.A.I.

Steady progress is reflected in the annual report of Scottish Agricultural Industries Ltd. Mr. W. D. Scott, chair-

man, reported that sales totalled £23.7 million (£22.7 million). Profits rose to £1,235,000 (£623,000); the 1958 profit compares with an average of £1,100,000 for the 1954-56 period.

The company's programme of plant renewal was now drawing to a close, said Mr. Scott. The adoption of ammonium phosphate and compound fertilisers of more concentrated type had resulted in a fertiliser with a degree of concentration some 50% greater than in the old style compounds. Mr. Scott believed there was every prospect of increased consumption of the main S.A.I. products.

Warwick Chemical (Yorkshire)

Bradford Dyers' Association and Sun Chemical Corporation of the U.S. have formed a new company, Warwick Chemical (Yorkshire). Sun Chemical hold a majority of the 20,000 £1 shares in issue.

Sun Chemical, through their division Warwick Chemical Co., manufacture chemical specialities for the textile trade. The new U.K. company will undertake the manufacture of these and others, and particularly a new type of resin which, apart from giving improved properties of crease-resistance and better wear to cotton fabrics, will enable such fabrics to withstand the bleaching processes normally and regularly used by laundries.

Part of Bradford Dyers dye works at Bowling, Bradford, will be leased to the new company, it is understood. Warwick Chemical will pool the manufacturing know-how of Sun Chemical with Bradford Dyers' user knowledge.

Market Reports

STEADY FLOW OF NEW HOME BUSINESS

LONDON Activity in the chemical markets has been fairly well sustained during the past week. Intake against contracts has covered good volumes and there has been a steady flow of new home trade buying orders for a wide range of industrial chemicals. Export business, too, continues at a reasonable level.

Undertone of the market remains firm, but price movements since the turn of the year have not all been upwards, and hydrogen peroxide has been in good demand at the lower quotations now ruling. Among the coal-tar products, pitch supplies are being called for in good quantities, and creosote-oil is in moderate request, but there has been little change in the general position.

MANCHESTER Prices on the Manchester market for heavy chemicals re-

main steady to firm. There is still plenty of room for improvement in the demand for the wide range of textile chemicals, but most other industrial outlets are specifying for reasonably good quantities against contract commitments. Shipping business in most sections, particularly to the Commonwealth markets, has been about maintained. A quietly steady demand for the light and heavy tar products is reported.

GLASGOW As was anticipated with conditions on the Scottish heavy chemicals market, now back to normal, trading showed a much improved position during the past week. Both demands against spot and contract needs were well maintained with quantities at reasonable levels. Prices tended to be firm.

Fairly quiet conditions continued in agricultural chemicals, while the export market still showed interest.

DIARY DATES

MONDAY 26 JANUARY

C.S.—Cambridge: Chemical Lab., Lensfield Rd., 5 p.m. 'Electronic structure and magnetic interactions in copper (II) complexes', by R. E. Rundle.
C.S.—Cardiff: Chemistry Dept., Univ. College, 5.30 p.m. 'Crystalline high polymers', by C. E. H. Bawn.
C.S.—Oxford: Inorganic chemistry lecture theatre, 8.15 p.m. 'Compressed gases as solvents', by J. S. Rowlinson.
Inc. Plant Engineers—Leeds: Fuel Dept., Univ., 7.30 p.m. 'Wilson project', by G. G. Lanham.
Inst. Rubber Industry with Plastics Inst.—Manchester: Grand Hotel, 6.45 p.m. 'Effects of irradiation on polymers and protective clothing', by A. Quinton.

TUESDAY 27 JANUARY

C.S. with R.I.C. and S.C.I.—Edinburgh: Biochemistry lecture theatre, Teviot Pl., 7.30 p.m. 'Use of deuterium in study of catalytic hydrogenation', by C. Kemball.
C.S.—Hull: Univ., 5 p.m. 'Reaction of atoms and free radicals', by J. C. Robb.
C.S. with R.I.C.—Nottingham: Chemistry Dept., Univ., 8 p.m. 'Growth of fluorocarbon chemistry', by R. N. Hazeldine.

Soc. Instrument Technology—London: Manson Hse., Portland Pl., 5.30 p.m. Symposium on flow measurement.

WEDNESDAY 28 JANUARY

R.I.C.—Slough: College of Further Education, 7 p.m. 'Molecular sandwiches', by G. Wilkinson.
S.A.C.—London: Feathers, Tudor St., E.C.4, 6.30 p.m. 'Determination of small quantities of toxic substances', by G. Gage.

THURSDAY 29 JANUARY

C.S.—Liverpool: Dept. of Inorganic and Physical Chemistry, Univ., 5 p.m. 'Organic semiconductors', by D. D. Eley.

S.C.I. with C.S. and R.I.C.—Bristol: Chemistry Dept., Univ., 6.30 p.m. S.C.I. jubilee memorial lecture: 'Colonial research—products and pesticides', by R. A. E. Galley.

FRIDAY 30 JANUARY

C.S.—St. Andrews: Chemistry Dept., St. Salvator's College, 5.15 p.m. 'Some aspects of chemistry of naturally occurring quinones', by R. H. Thompson.
C.S.—Southampton: Chemistry Dept., Univ., 5 p.m. Tilden lecture, 'Triplet state in chemistry', by G. Porter.

I.Chem.E.—Manchester: Midland Hotel, N.W. branch a.g.m., 3.30 p.m., annual dinner-dance, 7.30 p.m.

R.I.C.—Brighton: Technical College, 6.30 p.m. 'Chemotherapy', by M. W. Alford.

S.A.C.—Glasgow: James Craig Restaurant, 10 Woodlands Rd., 1.30 p.m. Branch a.g.m. and 'Identification of artificial colouring matters in food', by P. S. Hall.

S.C.I.—Plymouth: Technical College, 5.30 p.m. 'Science in coal industry', by A. R. Middleton.

SATURDAY 31 JANUARY

S.A.C.—Manchester: Nags Head Hotel, Lloyd St., 2.15 p.m. N. of England section a.g.m., and 'Synthetic foodstuff colours, control of quality', by H. E. Stagg.

R.I.C. Course on Trends In Biological Chemistry

THE Birmingham and Midlands section, Royal Institute of Chemistry, has arranged its spring lecture course for 1959 on 'Modern trends in biological chemistry' to take place in the Byng Kenrick Suite, College of Technology, Gosta Green, Birmingham. The programme is as follows:

21 February: 'Current trends in biological chemistry', by Professor M. Stacey; 'Physical methods in modern biological chemistry', by Dr. G. A. Gilbert.

28 February: 'The chemical engineering outlook', by Dr. N. Blakebrough; 'Recent trends in food research', by Professor A. C. Fraser.

7 March: 'Modern clinical biochemistry', by Mr. G. Thomas; 'Some aspects of recent work on protein structure', by Professor H. D. Springall.

14 March: 'Recent developments in medicinal chemistry', by Dr. F. L. Rose.

Registration forms and further particulars from Dr. M. Williams, 20 Conchar Road, Sutton Coldfield.

TRADE NOTES

New Berk Chemicals

F. W. Berk and Co. Ltd., Berk House, P.O. Box 500, Portman Square, London W.1, have added two chemicals to their agricultural range. The first is an insecticide, 25% malathion dispersible powder (active ingredient: O,O-dimethyl dithiophosphate of diethyl mercaptosuccinate), for the control of a wide range of pests. The second is the fungicide, 70% Maneb dispersible powder (active ingredient 70% micronised manganous ethylene bisdithiocarbamate), suitable for application to the lower plant stems and soil surrounding the plant.

Packaging Centre Exhibits

One of the latest permanent exhibitors at the Packaging Centre in Poland Street, London, is Johnsen and Jorgensen (Flint Glass) Ltd., Trident Glass Works, Herringham Road, London S.E.7, makers of Trident tubular glass containers. The display includes a complete range of ampoule and vial exhibits covering all the requirements for the packaging of capsules, tablets, serums and vaccines, and paint.

Ko-Kneader U.K. Agents

Buss A.G., manufacturers of Buss Ko-Kneaders (List system), processing equipment, etc., Basle, are making a change in their U.K. representation; for the past eight years their agents have been Aldersley Agencies Ltd. Now, in conjunction with a revision of the Buss European sales organisation, Hamilton Machinery Sales Ltd., 32 Buckingham Palace Road, London S.W.1, have been appointed agents in the U.K. and Ireland. Arrangements for the sale of Ko-Kneader equipment will continue in the hands of Mr. Christopher Hamilton.

Chemical Prevents Oil Pollution

C. H. Bailey and Co., South Water Ship Repairers, Alexander Docks, Newport, Mon., have developed a chemical compound which, they claim, can solve the problem of pollution of the sea by oil. It is stated that the compound makes it possible and practicable to separate the oil from the water in the sludge left in oil tankers after they have discharged their cargoes.

Tests have been carried out with the chemical, it is reported, for the Admiralty. A new company is also to be launched to market the chemical.

Hilger & Watts German Office

Hilger and Watts announce that a branch office is opening this month in Western Germany, at Witten, near Dortmund. The opening of this office follows the expansion of the company's business in Western Germany and in the Ruhr in particular.

Platinised Titanium Anodes

Metal and Pipeline Endurance Ltd. (MAPEL), Artillery Mansions, Victoria Street, London S.W.1, are now introducing platinised titanium anodes for the protection of condenser water boxes and internal protection of pipelines. In the

case of the condenser water boxes, one anode is installed in each pass and fed from a rectifier through a control unit. In the case of internal protection of pipelines the anodes are installed at intervals, depending upon the pipe diameter. Full protection can be given to all sizes of pipeline ranging from 12 in. diameter minimum, with water velocity up to 10 ft./sec. The cost of protecting a pipeline carrying sea water is said to be lower than a concrete or plastics lining to serve the same purpose of combating corrosion.

Negretti and Zambra

New editions of three catalogues are now available from the publicity department of Negretti and Zambra Ltd., 122 Regent Street, London, W.1. They are List T/50/1 which deals with a wide range of glass thermometers; List T/40/2, covering mercury-in-steel thermometers; and R30/IP, dealing with air-operated automatic controllers of the proportional type for process industries.

New Stellite Process

A new sprinkle fuse process for hardfacing with Stellite powder has been developed by Deloro Stellite Ltd., Shirley, Solihull, in collaboration with Radio Heaters Ltd., Wokingham, Berks. The process is said to offer many advantages where resistance to abrasion, corrosion or heat is necessary, such as on valve seatings, seat rings and discs, pump sealing rings and thrust plates; by eliminating welding skill; by the introduction of automatic heat control which reduces heating times; and by the more economic use of hardfacing alloys.

Changes of Address

Address of Metal Industries Ltd. is now Brook House, Park Lane, London W.1 (Hyde Park 6770).

Microcell Ltd. announce that their new head office address is Ingersoll House, 9 Kingsway, London W.C.2 (Covent Garden 1262).

Orkot Bushes

Orkot fabric-reinforced resin, made by the United Coke and Chemicals Co. Ltd., Orgreave, Handsworth, Sheffield 13, and proved as a successful material for rolling mill bearings, has recently been used in the production of bushes. A new leaflet gives a number of typical applications with properties of the material.

Page Hersey's New Products

Page Hersey Tubes, steel and plastics pipe manufacturers, announced that they will shortly be producing copper tubing, and in due course pipe and tubing made of aluminium and alloy steels.

An agreement has just been concluded by the company with New Rochelle Tool Corporation (Thermatool), New York, for exclusive Canadian rights for the production of Weldec copper tubing. The rights allow the use of a new high-frequency welding technique applicable to the welding of steel pipes and tubes, aluminium and various alloys.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 25 February

Valve structures for the control of fluids. Aro Equipment Corp. **809 384**
 Process for the production of polyamide silvers. Vereinigte Glanzstoff-Fabriken A.G. **809 478**
 Polymer solutions. Goodrich Co., B. F. **809 346**
 Process for the production of regenerated cellulose films. Du Pont de Nemours & Co., E. I. **809 628**
 Carbazole derivatives and process for the production thereof. Chemische Fabrik Promonta G.m.b.H. **809 488**
 Diatomic iodine-forming composition and method of making same. Heligen Products, Inc. **809 527**
 Diazotising aromatic amines. Farbenfabriken Bayer A.G. **809 350**
 Compositions for the control of slime-forming organisms. Buckman Laboratories, Inc. **809 351**
 Disulphonic acid amides of the anthraquinone series. Sandoz, Ltd. **809 491**
 Steroids and the manufacture thereof. Upjohn Co. **809 493**
 Liquid metal purifier. Babcock & Wilcox Co. **809 584**
 Process and apparatus for agglomerating dust particles in flowing gases. Phoenix-Rheinrohr Aktiengesellschaft Vereinigte Hütten-und Röhrenwerke. **809 397**
 Tetracycline derivatives. Bristol Laboratories, Inc. **809 585**
 Androstene derivatives. Searle & Co., G. D. **809 494**
 Thiophosphoric acid esters. Farbenfabriken Bayer A.G. **809 355**
 Recovering gaseous fission products from nuclear reactor. Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. **809 586**
 Process for dyeing polyolefin textile materials. Vereinigte Glanzstoff-Fabriken A.G. **809 495**
 Preparation of carboxylic acid esters. Du Pont de Nemours & Co., E. I. **809 496**
 Hot workability of titanium alloys. Metallgesellschaft A.G. **809 587**
 Process for upgrading gasoline. Universal Oil Products Co. **809 635**
 Process for the isomerisation of saturated hydrocarbons. Universal Oil Products Co. **809 636**
 Purification of naphthalene. Koppers Co., Inc. **809 589**
 Organosilicone foams. Midland Silicones, Ltd. **809 497**
 Oil compositions having increased stability towards free radicals. Shell Research. **809 360**
 Process for chlorination of metal-free phthalocyanine. General Aniline & Film Corp. **809 498**
 Process for chlorinating dimethyl ether. Dow Chemical Co. **809 637**
 Treatment of articles formed of high-temperature cobalt-base alloys. General Motors Corporation. [Addition to 808 922.] **809 638**
 Production of uranium. Atomic Energy Commission United States of America. **809 408**
 Process for the manufacture of linalool. Hoffmann-La Roche & Co. A.G., F. **809 409**
 Preparation of N-methylethyleneglycinonitrile. Abbey, A. (Dow Chemical Co.). **809 410**
 Oxidation of fatty acids. Celanese Corporation of America. [Divided out of 809 451.] **809 452**

Open to public inspection 4 March

Nuclear fuel elements. U.K. Atomic Energy Authority. **809 671**

Method and apparatus for the polymerising of resins on moving material. Spooner Dryer & Engineering Co. Ltd. **809 821**
 Treatment of materials to improve water-repellency. Bradford Dyers' Assoc. Ltd. **809 822**
 Apparatus for controlling the rate of supply of a particulate material to a container. Hedley & Co. Ltd., T. **809 673**
 Separating materials of different specific gravities such as coal. Simon-Carves Ltd. [Cognate application 25 387.] **809 955**
 Method of producing synthetic organic fibrous materials. Rasmussen, O. B. **810 001**
 Vapour phase polymerisation of certain 1-olefins. Phillips Petroleum Co. **809 784**
 Production by deposition of particulate metal. Brennan, J. B. **809 956**
 Water cooling structures. Veladini, C. E. G., and Moltum, J. K. **809 986**
 Means for cooling water. Veladini, G.E.C. **809 967**
 Catalyst and processes for its manufacture and use. Universal Oil Products Co. **809 786**
 Process and apparatus for vaporising metals in vacuo. Vac Anstalt. **809 674**
 Hormone preparations. Ciba Ltd. **809 827**
 Manufacture of steroids. Ciba Ltd. **809 911**
 Apparatus for drying or roasting, and reducing or communicating materials. Arsan, N. T. **809 789**
 Process for separating and preserving materials. Arsan, N. T. **809 777**
 Continuous process for preparing meta diisopropylbenzene. Bataafsche Petroleum Maatschappij N.V., De. **809 908**
 Active substance from plants of the Rauwolfia species and process for manufacturing same. Ciba Ltd. **809 912**
 Method of and apparatus for the bonding of thermoplastic sheet assemblies. S.a.r.L. Jop, and S.a.r.L. Etablissements Taulet & Cie. **810 002**
 Acid derived from an alkaloid named deserpidine, its esters and salts thereof, and process for their manufacture. Ciba Ltd. **809 913**
 Liquid-fuel containers. Imperial Chemical Industries Ltd. **809 929**
 α -Amino acetophenone derivatives and compositions containing them. Philips Gloeilampenfabrieken N.V. **809 791**
 Metallising fully synthetic high polymer textile fibres. Deutsche Gold- Und Silber-Scheideanstalt vorm. Roessler. **809 958**
 β -Thio-substituted acylamino-nitro-propionophenones and process for the preparation thereof. Farmaceutici Italia S.A. **809 794**
 3-Substituted indoles. Upjohn Co. **809 795**
 Polymeric compositions. Imperial Chemical Industries Ltd. **809 745**
 Process of dispersing pigments in liquid media and/or reducing the particle size of pigments. Du Pont De Nemours & Co., E. I. [Addition to 686 234.] **810 005**
 Fatty materials. Unilever Ltd. **810 006**
 Grafting polymers or copolymers. Centre National de la Recherche Scientifique. **809 838**
 Production of moistureproof sheet wrapping materials. British Cellophane Ltd. **810 007 & 809 749**
 Dewatering in the manufacture of paper and board. St. Anne's Board Mill Co. Ltd. **809 965**
 Caramel colour manufacture. Union Starch & Refining Co., Inc. **809 747**
 Adhesives and methods of using the same. Philip's Gloeilampenfabrieken N.V. **809 748**
 Indole derivatives. Imperial Chemical Industries Ltd. **809 691**
 Cyclopentanophenanthrene compounds. Laboratoires Francais de Chimiotherapie. **810 009**
 Production of metals. U.K. Atomic Energy Authority. **809 693**
 Water-resistant polyurethane foams. U.S. Rubber Co. **809 697**
 Continuous thermal process of making carbon black. Cabot, Inc., G. L. **809 802**
 Preparation of aromatic nitriles and imides. Distillers Co. Ltd. [Addition to 796 765.] **809 704**
 Method of preparing secondary aromatic amines. Goodrich Co., B. F. **809 752**
 Biologically active compositions. Shell Research Ltd. **809 708**
 Oxidation of trivalent titanium compounds contained in solid titaniferous materials. Titan Co., A.S. **809 753**
 Liquid storage tanks. Esso Research & Engineering Co. **809 808**

MAPAC polythene bags & liners

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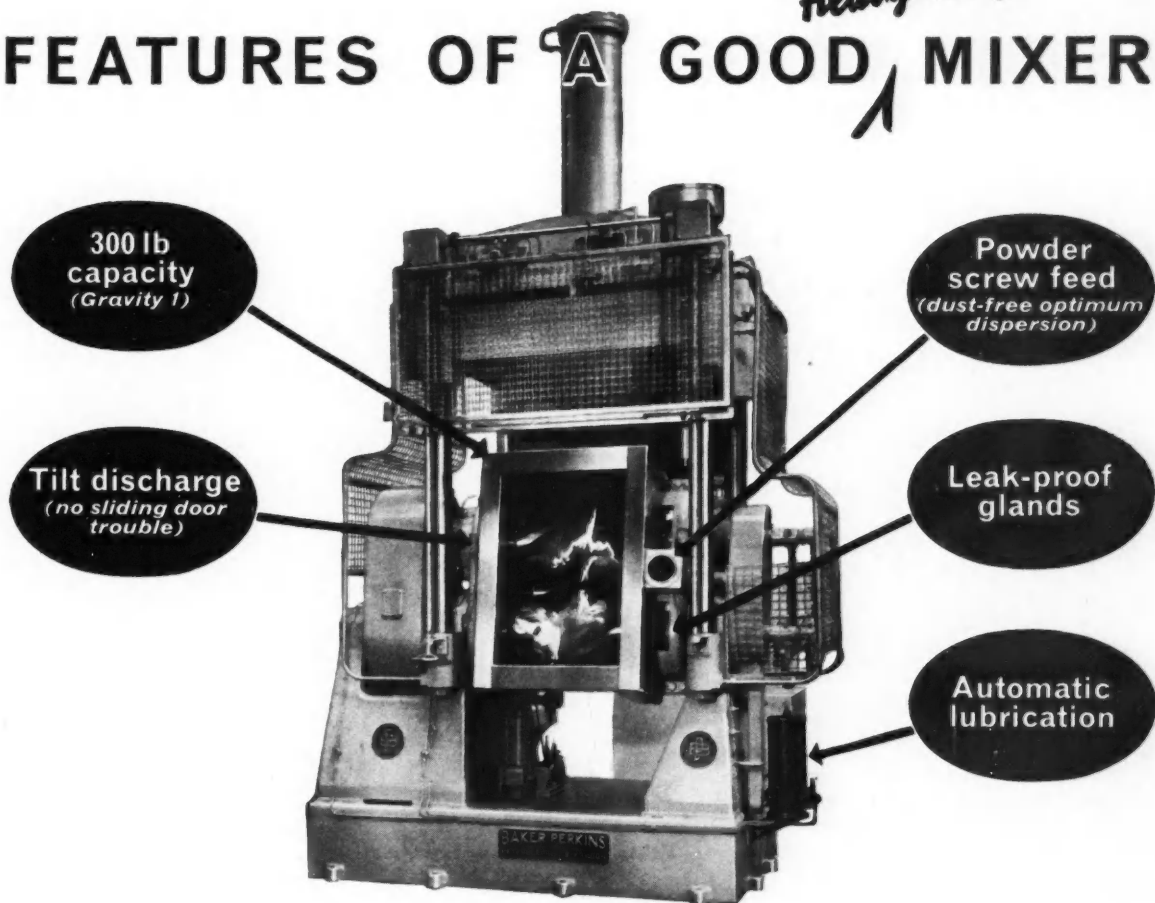


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